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# Trade and Development

## Impact of Foreign Aid on U.S. Agriculture

Gary Vocke, editor

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**Trade and Development: Impact of Foreign Aid on U.S. Agriculture.**  
Gary Vocke (editor). Agriculture and Trade Analysis Division, Economic  
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### **Abstract**

The papers in this proceedings were presentations for the 1989 Annual Meeting of the American Association for the Advancement of Science (AAAS); Technical Session, "Impact of Foreign Aid on U.S. Agriculture," San Francisco, January 15, 1989.

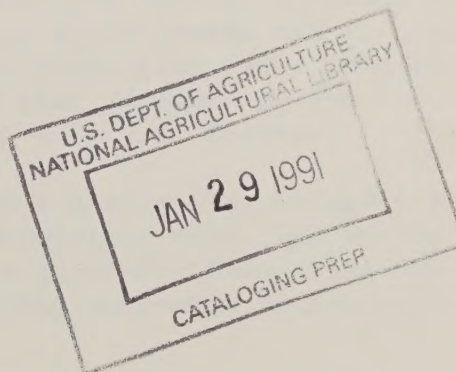
This report reviews the role of the various types of foreign assistance and the international factors influencing their effectiveness in promoting economic development. The focus is on the analysis of Third World economic development and import markets for agricultural products. The report includes a strategic assessment of U.S. agricultural competitiveness in Third World markets, the balancing of the agricultural and nonagricultural trade interests in the United States, and assistance to developing countries.

**Keywords:** Foreign aid, agricultural trade, economic growth, agricultural development.

### **Acknowledgments**

The editor organized the session for the AAAS and coordinated this report. The opinions expressed by the authors, however, are their own and do not necessarily represent the position of ERS or AAAS.

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# Trade and Development

## Impact of Foreign Aid on U.S. Agriculture

Gary Vocke, editor

### Introduction

Gary Vocke<sup>1</sup>

The U.S. Government is attentive to the prospects of Third World countries for a number of reasons, including foreign policy interests, the benefits of world economic and political stability, the moral obligations of the more affluent nations, and the encouragement of market-based economies and the democratic principles they engender. U.S. interests also include agricultural exports to those countries.

Robert L. Thompson writes, "If we desire a profitable and economically healthy American agriculture in the 1990's and the early 21st century of a similar size to that which we have today, we have to sustain our export performance. If we want our farm sector and associated agribusinesses to be bigger than they are now, or to put any of the presently underutilized resources back to work, we will have to export more because that is really the only potential growth market of any size."

G. Edward Schuh proposes that developing countries can be future markets for U.S. exports, but only if there is economic growth. That economic growth, Schuh argues, can best be promoted with U.S. foreign assistance if developing countries are not allowed to use the assistance to put off needed reforms within their own economies and if developed countries liberalize trade to enable the developing countries to earn the foreign exchange they need for development through exporting of their agricultural and nonagricultural products. Helping other countries to strengthen their economies may create some competition, but Schuh stresses that economic growth will provide expanding markets for everybody, including U.S. farmers.

James P. Houck and Charles E. Rossman's statistical analysis supports the case that aid to improve agriculture in developing countries through successful technical assistance and education is generally beneficial for U.S. farm exports. Since virtually all developing countries depend heavily on

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agriculture for employment and output, economic performance in total depends on improved performance in agriculture. A more prosperous national economy, in turn, leads to greater imports of cereals and other agricultural products.

In my article, I describe how improved agricultural technology (sometimes the result of foreign assistance) raises output and sometimes reduces agricultural imports. However, import markets do not always disappear, and new import markets have opened as rising income from economic growth creates a demand for commodities not well suited for local production and where demand for feed ingredients is rising. The need for feed ingredients increases rapidly with the shift to more animal products in diets as incomes rise.

Earl D. Kellogg discusses the recent history of Third World farm trade with developed countries, including the United States. He concludes that loss of trade share by U.S. farmers during the 1980's was due to increased competition from developed countries, not increased production in the Third World. The developing countries are now less competitive in export markets and are becoming more dependent on agricultural imports with economic development.

If this economic development continues, Kellogg expects that food demand in developing countries will continue to outpace production. Kellogg advocates using foreign assistance to promote economic growth. To minimize conflicts with U.S. agricultural interests, this foreign assistance should be strengthening linkages between farm output and general economic growth. This assistance includes investments in rural infrastructure, rural education, and agribusiness.

Robert L. Thompson concludes that the most important factor influencing the size of the market for U.S. agricultural exports is economic growth and that foreign assistance has a role in promoting this economic growth. Thompson also discusses the economic boost to developing countries if the GATT negotiations succeed in reducing trade barriers against exports. Exports can accelerate domestic economic growth and earn the foreign exchange needed to pay for additional agricultural imports.

To compete for these markets, the United States cannot mask its comparative advantage with farm policies that raise production costs or set price supports too high or with macroeconomic policies that overvalue the dollar.



## **Types, Roles, and Effectiveness of Foreign Assistance**

G. Edward Schuh<sup>1</sup>

I will limit my discussion to economic assistance, which is most relevant to the main theme of the session, "The Impact of Foreign Aid on U.S. Agriculture."

I should state some of my biases from the beginning. First, I believe that providing foreign economic assistance to low-income developing countries is in this Nation's best interests, and, in particular, in the best interests of U.S. agriculture. There are moral issues involved, especially as our world increasingly becomes a global village. The present disparity in per capita incomes between the United States and many developing countries is on the order of 40 to 1. There are also foreign policy implications, as we increasingly need to live by our wits and, thus, influence the policies of other countries. More important than any of these is the pragmatic question of our future markets. Future markets for U.S. agriculture will be in the developing countries. Those markets will emerge only if those countries experience economic development. It is, therefore, in our best interest to promote their economic development.

Second, our resources for development assistance will inevitably be limited. Thus, it is imperative that the resources we provide to developing countries be used in high payoff activities.

Third, if we are wise in how we collaborate with other countries in furthering their development processes, we can benefit a great deal in the form of knowledge that redounds to our society. These benefits will come about only with specific forms of development assistance.

The remainder of my comments is divided into three parts. First, I will provide some background on the issues before us. Second, I will review briefly the various forms of economic assistance. Third, I will attempt to make some assessment of the effectiveness of the various forms of economic assistance.

### **Background**

Americans tend to have about as many misperceptions about foreign assistance as they do about any aspect of our economic policy, domestic or international. We tend to view ourselves as the most benevolent society in the world when it comes to providing foreign aid. Yet, we rank last among the 17 industrialized countries in the share of our gross national product (GNP) which we provide as foreign aid. That share is currently about 0.11 or 0.12 percent of our GNP. This is not a recent development. We have ranked toward the bottom of the list for some time when measured by this criterion. This is a far cry from the days of the Marshall Plan at the end of World War II when, for a couple of years in a row, we transferred as much as 3 percent of our GNP to Europe and

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<sup>1</sup>Dean, Humphrey Institute of Public Affairs, University of Minnesota, Minneapolis.



other countries to assist in their economic recovery and reconstruction. Unfortunately, we have had a tendency to live on our past reputation.

It is true that for quite some time we have been the largest provider of foreign aid in an absolute sense. But, in evaluating our performance we need to take into account the fact that even after a sustained period of relative economic decline on the international scene, we still account for approximately 30 percent of global GDP. Moreover, Japan is about to provide a larger amount of foreign aid in an absolute sense than we do.

A second element of the background for a discussion of foreign assistance is to put it in perspective relative to the options that policymakers and nations have before them. The late Harry Johnson referred to foreign aid as the "soft" option for policymakers, compared with the "hard" option of liberalizing international trade (1).<sup>2</sup> A soft option enables policymakers in developing countries to beg off from undertaking needed economic reforms.

Foreign aid is soft to the donor countries because it is usually provided in lieu of trade liberalization, which would enable the developing countries to earn the foreign exchange they need for development purposes by increasing their exports.

Finally, the third part of the background to foreign assistance is the emergence of the international capital market, which began in the mid-1960's and evolved rapidly in size and scope through the end of the 1970's and into the early 1980's. Although now somewhat diminished, this capital market is still very substantial.

In the 1950's and early 1960's, a significant share of the transfer of capital among countries was through foreign aid. Today, the international debt crisis aside, there is an ample international capital market that developing countries can use to finance their development. This market is important in evaluating the potential contribution of foreign assistance.

### **The Forms of Economic Assistance**

Economic assistance is usually classified under two categories: project and balance-of-payment supports. Under each category there are a number of different kinds of foreign assistance. Also, some types of aid, such as food aid, can be in both categories.

Project support provides assistance in making investments in certain kinds of capital deemed necessary to promote economic development. An important form of project assistance is to improve the physical infrastructure of an economy. These infrastructures include roads and highways, trains and railroads, port facilities, dams, irrigation systems, and urban water and sewage systems. The goal of this form of economic assistance is to add to the capacity of the economy.

Project assistance need not be limited to physical capital. It can also be used to increase the capacity of educational systems, to support research and

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<sup>2</sup>Underscored numbers in parentheses are listed in the References at the end of this paper.



extension systems, and to provide technical assistance for a wide variety of purposes.

A third form of project assistance is for institutional development. Specific kinds of institutional arrangements are viewed as critical to the process of promoting economic development. Among these are colleges and universities, which train the cadres for a modern society; graduate programs, which train professionals for new research systems and colleges and universities; research institutions; extension systems; future markets; and market information systems. The goal is to develop new institutions, such as a graduate training program, or to strengthen existing institutions.

A fourth form of project assistance is dedicated to international institutions that provide services to developing countries. An important example is the Consultative Group for International Agricultural Research which involves some 13 international agricultural research institutions that are strategically located around the world. This system is supported almost exclusively by the international donor community. Its purpose is to help develop new production technology for the tropical food sector.

A fifth kind of project assistance is for rural development projects. These projects are often a mixture of different forms of assistance. They may finance some investments in physical infrastructure; some investments in education, training, and health care; some institutional development; and some linkages of local institutions to those on the international scene. Rural development projects tend to be area development projects.

Balance-of-payment support, the second main category of foreign aid, also takes a variety of forms. In some cases, it is used as a pure resource transfer to enable the country to finance a higher rate of economic growth. In this sense, it may displace borrowings from the international capital market, although it may do so on significantly easier terms.

A much more common form of balance-of-payment support in today's world is for adjustment purposes. Loans for this purpose tend to take two forms: structural adjustment and sectoral adjustment, with the latter being more narrowly focused. Adjustment loans are designed primarily to help countries get through the difficulties associated with policy reform. These reforms typically involve major devaluation of a nation's currency. Currency devaluation usually causes imports to be more costly in terms of domestic resources. It also implies a major reallocation of resources within the domestic economy, from the production of home goods and services to the production of exports and the goods and services that compete with imports.

Such policy reforms create significant shocks to an economy. For example, devaluations are likely to cause a significant drop in imports, thus, prejudicing development efforts needed to restructure the economy. These same devaluations will eventually lead to a restructuring of the economy toward a configuration that exports more and, thus, earns additional foreign exchange, and which imports less because of the strengthening of import-competing sectors. The purpose of the adjustment loans is to help get through this transition period, either by helping to fill the foreign exchange gap or by helping to make the investments needed to restructure the economy. These loans tend to be quick disbursing (1-2 years), with a great deal of policy conditionality.

A final form of foreign aid is food aid, which provides economic assistance in the form of food. The U.S. food aid program, Public Law 480 or Food for Peace Program, originally had multiple objectives, not the least of which was market development. Today, an even larger share of our food aid program goes for development purposes.

Food aid has long had its critics, largely on the grounds of the disincentive effects it creates for producers in the recipient country and because of the purported dependency relationships that it creates. Both of these are tractable problems. The disincentive effects can be kept to a minimum if the food is introduced into the economy as income transfers to the recipient families. Under income transfers, there will be a significant increase in demand associated with the increase in supply, which the aid represents. Policies to be avoided, on the other hand, are the use of food aid for strict balance-of-payment support and the monetization of the food aid to provide revenue for the government.

Dependency relationships can be avoided if more policy conditionality is tied to the food aid. Pushing the economy to a more efficient configuration will reduce the tendency to become dependent on food aid.

Food aid can be used as project aid as well as balance-of-payment support. It is worth noting that many of the disincentive and dependency problems are not unique to food aid. They apply to other forms of economic assistance, especially those directed to balance-of-payments support.

#### **Some Comments on Effectiveness**

This Nation is going through a period of aid tiredness. U.S. citizens now tend to see foreign assistance as a bottomless pit and wonder whether we will ever get out of the business. At the same time, they are disillusioned with the results of our foreign aid program, believing that these programs contribute very little to further economic development and fail to reach the poor people in the recipient countries. To the extent the programs are successful, there is a concern that foreign assistance strengthens sectors in other countries that are competitive with ours and, thus, are counterproductive in furthering our own economic and political interests.

In taking stock of our foreign aid programs, we should note a number of things. First, we need to be realistic about what to expect from foreign aid. After all, foreign aid involves a relatively small amount of our resources relative to total investments in the developing countries. If expressed in per capita terms, it usually amounts to less than \$1 per person. Unless the aid is used for particularly strategic purposes with high payoffs, one cannot expect dramatic results. Aid can still be quite valuable to the recipient country and in promoting economic growth.

Second, we have not given as much attention to the economic calculus as we could have in allocating our foreign aid. We allocate nearly 85 percent of our foreign aid to two countries (Egypt and Israel), with the remaining 15 percent going to a long list of countries. With such a policy, it is very difficult for our resources to have a significant effect on other countries or to influence their economic policy.

Third, in one of the few serious empirical efforts to estimate the social rate of return in the recipient countries from foreign aid, Willis Peterson found



that the rate of return was indeed high--50 percent or more (2). That suggests that foreign assistance is more effective than is widely believed. Peterson found the rates of return to conventional investments in these countries to be on the order of 15 percent.

Fourth, it seems that much could be gained from allocating our foreign aid resources more carefully on the basis of economic criteria, with less attention given to political criteria. If we were to do this, we would probably concentrate our limited resources on fewer countries and allocate those resources more carefully to high-payoff investments. We would thus tend to have a critical mass more frequently. The effects of this aid could be spread more widely by the economic development it would create.

Fifth, conditionality should be a critical dimension of our foreign assistance program. If recipient countries are not willing or able to implement policies that lead to a more efficient allocation of their resources, we should not assist them in their development programs. However, we should be more creative in our use of foreign aid to make it possible to bring about policy reform in these countries. We can do this by means of targeted feeding programs to help affect the almost inevitable increase in food prices associated with major policy reforms.

Sixth, narrowly construed balance-of-payment support should be avoided at all costs, especially if support is in lieu of policy reform. Balance-of-payment problems usually suggest an inefficient configuration of economic policies. Adjustments in assistance and balance-of-payment support should be provided only after reforms are in place.

Seventh, and a corollary of the preceding point, foreign aid should be provided primarily in project form and for projects designed to increase the longer term capacity of the economy. Foreign aid in project form will contribute most to economic development.

Finally, foreign assistance should be used primarily to increase the stock of human capital in the developing countries. The large international capital market will provide most of the resources for the physical infrastructure and other conventional forms of investment so long as economic policies are efficient. If they are not, it is a mistake to use foreign aid to enable policymakers to avoid or delay the day of reckoning.

The opportunities for investing in human capital in these countries are great, and these forms of investments typically have a high degree of leverage and complement investments in physical capital. Human capital includes formal schooling and training programs, higher level education, research and extension, and institutional development. The institutional development activities the United States engaged in back in the 1960's and early 1970's have had an enormous payoff, the fruits of which are still to be realized in many countries.

#### **Concluding Comments**

This Nation needs to stop viewing its foreign assistance program as an act of philanthropy or as a way of currying political favor, and view it as a hard economic decision--one that we undertake as being in our best interests. Our future markets are likely to be in the developing countries, and they will be there only if those countries experience economic development.

Helping these countries to develop their economic capacity may well create competition for our own private sector. But in the longer term, that competition may also be in our own best interests. Think where our automobile industry would be had it not been subjected to competition from abroad. The important point is that by promoting economic growth and development, markets expand for everybody.

If we use a significant part of our foreign assistance to develop collaborative research efforts with colleagues in other countries, we add to the stock of knowledge on the world scene, while at the same time gaining access to that knowledge. In a world in which we as a nation increasingly have to live by our wits, that knowledge can be of tremendous value to us.

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1. Johnson, Harry. Economic Policies Toward Less Developed Countries. Brookings Institute. Washington, DC, 1967.
2. Peterson, Willis. "Rates of Return on Capital: An International Comparison," Kyklos. Vol. 42, Feb. 1989, pp. 203-17.



# **Agricultural Productivity and International Food Trade: A Cross-Section Approach**

James P. Houck and Charles E. Rossman<sup>1</sup>

Agricultural assistance to less-developed nations remains unpopular among U.S. farm organizations and commodity groups. Renewed strength in world markets and effects of the 1988 North American drought have muted, but not snuffed out, opposition to technical assistance and scientific education for the largely agricultural countries of the Third World.

The core of this opposition is that we systematically help Third World countries grow commodities that we produce. These countries respond with increased output, replace U.S. exports, and leave U.S. farmers holding the bag. Those holding this view are critical of agricultural aid dispensed by Government agencies (such as the U.S. Agency for International Development), by land-grant schools (such as the University of Minnesota), and by international organizations (such as the World Bank).

Although there is a sizable amount of professional literature addressing this topic, relatively few broad statistical studies have been published. Many articles and papers are national or regional case studies or are discursive and qualitative arguments (1, 9, 10, 11, 13, 14, 15).<sup>2</sup> The econometric and quantitative analyses by Bachman and Paulino (3) and more recent work by Kellogg, Kodl, and Garcia (7), by Christiansen (4), by Anderson (2), by Maginnis (8), and by de Janvry and Sadoulet (5) are generally consistent with results presented in this paper and in another related article (6).

## **The Approach and the Data**

Our objective is to continue this debate. Consider the main argument of those who believe that foreign agricultural development is likely to be detrimental to U.S. agriculture. The chain of reasoning that leads from one end of this argument to the other is quite complex and not at all straightforward.

First, we have to assume that funds appropriated for agricultural assistance actually find their way into new or existing projects for technical assistance or education. Then, it must be true that these projects actually boost farm production beyond what would have occurred in the favored countries. Next, we must be able to show that this augmented farm production somehow replaces imports of agricultural goods from or expands competitive exports onto the world market. Finally, we are required to assert that these changes work their way through the complex channels of world commerce to the detriment of U.S. agricultural interests. All things considered, no one could reasonably test all the links in this chain.

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<sup>2</sup>Underscored numbers in parentheses are listed in the References at the end of this paper.

We will focus on the central proposition of this argument; namely, that agricultural development in the less-developed world leads to diminished trade for traditional agricultural exporters. To begin, assume that agricultural assistance is at least partially successful and increases farm productivity in the affected countries. What more can be said?

The answer relies on some relatively simple statistical analysis conducted recently with information drawn from sizable cross sections of developing nations over a 6-year period. Using cross-section data allows us to draw longrun inferences that may be masked in time series data. Using more than one annual cross section of data permits us to examine the stability of apparent relationships revealed in any given cross section.

Here is how this particular study unfolded. First, we adopted the premise that when agricultural development is successful, whether assisted by outsiders or not, the longrun economic value of farmworkers in the affected nations must increase. So, for various sample countries, we collected 1981-86 data on value added per worker in agriculture. This measure is the total annual value of agricultural output in each nation less the value of purchased inputs used in production, all divided by the number of agricultural workers. This variable reflects the productivity of agriculture in each sample country.

Second, we relate this agricultural productivity measure for each sample nation to its annual per capita gross domestic product (GDP). Since virtually all of these countries depend heavily on agriculture for employment and output, the longrun link between economic performance in agriculture and economic performance in total is likely to be significant.

Third, we linked per capita GDP data to national imports of food and related products. This linkage enabled us to examine how the overall economic performance of the sample nations affects their agricultural trade behavior. In addition, we also related variations in agricultural productivity to variations in per capita exports of primary agricultural products.

Before we present and discuss the results of this analysis, let us consider the specific data employed. The countries to be included were drawn from two categories of the World Bank's listing of national economies by stage of economic development: (1) low-income economies and (2) lower middle-income economies. Annual cross-section data from 1981 through 1986 for countries in these two categories were assembled from recent World Bank reports (16).

The countries included in these two categories and reported by the World Bank had populations in excess of 1 million persons and represented 65 percent of the world's 1984 population. In 1984, annual per capita gross national product (GNP) ranged from \$110 for Ethiopia to \$1,620 for Syria. Although the number of countries reported in these two categories averaged about 70 during 1981-86, the availability of suitable data limited the annual samples to fewer countries, depending upon the particular analysis conducted. Next, the following variables were assembled annually for each low- and lower-middle-income country from basic data reported in the World Bank's annual World Development Reports (16).

GDP = Per capita gross domestic product. This variable is similar to gross national product (GNP) as a measure of national economic activity but somewhat more suitable for international comparisons.



VAW = Value added per worker in agriculture. This is the total value of national agricultural output less the value of purchased inputs all divided by the number of agricultural workers. This variable indicates the economic performance or efficiency of agriculture in each sample country.

VMW = Value added per worker in manufacturing. This was calculated for the manufacturing sectors in the various sample countries and is comparable to VAW. This variable indicates production efficiency in manufacturing.

CIC = Per capita cereal imports, including wheat, rice, rye, and coarse grains.

FIC = Per capita food imports. This variable includes food and feed products in SITC sections 0, 1, and 4 plus live animals, beverages, tobacco, nuts, fats, oils, and oilseed. This variable is a very broad measure of food and agricultural products in international trade.

XPC = Primary product exports per capita. These are raw or semiprocessed agricultural, forestry, or fishery products.

In most analyses reported, the variables were converted to natural logarithms so that proportional relationships could be highlighted. This conversion is indicated by an asterisk (\*) attached to the various symbols.

While the major emphasis of this paper is on low- and lower-middle-income countries, some discussion of estimated relationships among all middle-income nations is presented in Appendix A.

### Agricultural Productivity and General Economic Performance

In each of the six annual cross sections, the sample nations displayed a strong, positive association between agricultural productivity (VAW) and per capita income (GDP). The figures in table 1 summarize least squares regressions of the following equation fitted annually:

$$GDP^* = \hat{a} + \hat{b} VAW^* \quad (1)$$

The coefficients of determination ( $r^2$ ) are relatively high for cross-section studies of this kind. Notice that the estimated regression coefficients on  $VAW^*$  are positive and highly significant. The number of observations vary from year to year because of the changing number of nations in the two income categories and because adequate data are not always available for each nation.

The data in table 2 provide a somewhat more sophisticated look at the same phenomenon. Variation in  $GDP^*$  is related to the simultaneous influences of productivity in both agriculture ( $VAW^*$ ) and manufacturing ( $VMW^*$ ). The addition of manufacturing productivity data naturally added to the explanatory power of each equation and did so with generally statistically significant coefficient estimates of the following annual regression equation:

$$GDP^* = \hat{a} + \hat{b} VAW^* + \hat{c} VMW^* \quad (2)$$

When manufacturing productivity is taken into account, the net estimated relationship between VAW and GNP decreased somewhat from the values in table 1 but remained strongly statistically significant. There seems to be a tendency

Table 1--Cross-section regressions: Agricultural productivity per worker (VAW\*) versus per capita income (GDP\*) in low- and lower-middle-income countries, 1981-86

Year with dependent variable GDP*	Coefficient VAW*	R <sup>2</sup>	Number of observations
1981	0.91 (11.8) <sup>1</sup>	0.72	56
1982	.96 (11.3)	.70	57
1983	1.00 (11.0)	.70	54
1984	.93 (11.4)	.71	56
1985	.84 (11.3)	.69	61
1986	.75 (9.3)	.59	61

\* = All variables are measured in natural logarithms.

<sup>1</sup>Values in parentheses are t-ratios of estimated coefficients.

Table 2--Cross-section regressions: Agricultural productivity per worker (VAW\*) and manufacturing productivity per worker (VMW\*) versus per capita income (GDP\*) in low- and lower-middle-income countries, 1981-86

Year with dependent variable GDP*	Coefficient:		R <sup>2</sup>	Number of observations
	VAW*	VMW*		
1981	0.79 (9.1) <sup>1</sup>	0.16 (2.4)	0.74	54
1982	.81 (8.4)	.19 (2.7)	.73	55
1983	.77 (8.3)	.26 (4.5)	.78	52
1984	.80 (9.5)	.21 (3.3)	.75	55
1985	.63 (7.5)	.24 (3.6)	.72	49
1986	.60 (7.0)	.29 (4.4)	.65	54

\* = All variables are measured in natural logarithms.

<sup>1</sup>Values in parentheses are t-ratios of estimated coefficients.



for agricultural productivity to exert a smaller relative influence on GDP as time passes. At least, the computed least squares association between the two diminishes over time.

Of course, there are many other factors beyond VAW and VMW that influence GDP, even among low-income nations. The objective of this study was not to construct a macroeconomic model suitable for a cross section of 50-60 nations. However, the dominance of agriculture in these nations makes these simple estimated relations rather compelling, yet not at all surprising. Nothing in these estimates implies that expenditures for assistance projects necessarily will lead to improved productivity in agriculture much less to overall economic growth. But, if projects and education are successful, then farm productivity will surely rise. If agricultural productivity rises, then broader economic benefits ensue. These empirical estimates are consistent with that argument.

### **Economic Performance and Agricultural Imports**

Having established an important, positive link between agricultural productivity and GDP, let us now consider the connection between national GDP and agricultural import behavior. Many factors influence trade activity, but no one doubts that income is an important element. Without attempting to devise an elaborate economic model of trade determination, we postulated the following simple relations between GDP per capita and agricultural imports.

$$\begin{aligned} \text{CIC}^* &= \hat{a} + \hat{b} \text{GDP}^*, \text{ or} \\ \text{FIC}^* &= \hat{a} + \hat{b} \text{GDP}^* \end{aligned} \tag{3}$$

The ordinary least square estimates summarized in table 3 illustrate how GDP\* and agricultural imports were related in our six annual cross sections when these two alternative measures of imports are used. The first set of estimates in each year indicates how per capita cereal imports (CIC\*) and GDP\* are associated with each other. The second set shows how a broader measure of food imports (FIC\*) and GDP\* are related. Both linkages are positive and statistically significant. The regressions using FIC\* as the indicator of food imports are stronger in terms of statistical fit, and the estimated coefficients are generally larger than when only cereals are used. This is surely a plausible result and coincides with the theories of economic development and growth. Higher overall economic activity is associated with increased imports of agricultural and food products, no matter how they are measured.

### **The Basic Relations in First Differences**

Because the data employed in these annual cross-section analyses come from much the same set of countries, it is possible to conduct an investigation of the relation between changes in agricultural productivity and changes in income and trade. By pairing individual country data in 1984 with that in 1986, we computed some first-difference analyses. The information in table 4 is on two such regression equations.

These equations indicate that recent 2-year increases in agricultural productivity are associated with 2-year increases in per capita GDP to significant increases in food imports (FIC). These estimates help to buttress the linkages established in the various annual cross-section analyses.

Table 3--Cross-section regressions: Per capita income versus agricultural imports measured as cereals (CIC\*) or as all food (FIC\*) in low- and lower-middle-income countries, 1981-86

Year with dependent variable	Coefficient GDP*	t-ratio	R <sup>2</sup>	Number of observations
1981:				
FIC*	0.69	(3.4) <sup>1</sup>	0.16	63
CIC*	1.01	(5.3)	.39	46
1982:				
FIC*	.53	(2.7)	.11	60
CIC*	1.01	(5.0)	.41	39
1983:				
FIC*	.85	(4.4)	.25	61
CIC*	.86	(5.0)	.36	47
1984:				
FIC*	1.00	(4.8)	.25	63
CIC*	1.06	(5.4)	.42	41
1985:				
FIC*	.81	(3.5)	.16	65
CIC*	.98	(6.1)	.40	59
1986:				
FIC*	1.01	(5.0)	.29	65
CIC*	1.04	(6.9)	.43	63

\* = All variables measured as natural logarithms.

<sup>1</sup>Values in parentheses are t-ratios of estimated coefficients.

Table 4--Cross-section, first differences regressions, using differences of logarithms between 1984 and 1986, in low- and lower-middle-income countries

Dependent variable	Coefficient		R <sup>2</sup>	Number of observations
	VAW*	GDP*		
ΔGDP*	0.35 (4.9) <sup>1</sup>		0.31	55
ΔFIC*		1.37 (4.3)	.32	41

\* = All variables measured as changes in natural logarithms.

Δ = "change in."

<sup>1</sup>Values in parentheses are t-ratios of estimated coefficients.



## Agricultural Productivity and Exports

As agricultural productivity changes in less-developed nations, it is sensible to suppose that corresponding changes also occur in their agricultural exports. The systematic linkage between them would be more direct since an intermediate dependence on per capita income is less obvious. The regression estimates presented in tables 5 and 6 illustrate the extent and significance of this linkage when VAW\* alone and then both VAW\* and VMW\* are used to explain relative changes in primary commodity exports (XPC\*). Primary commodities, as used here, are agricultural, livestock, forest, and fisheries products. They include numerous tropical products and other commodities not directly competitive with temperate zone grains, feeds, and livestock products exported by the United States.

The regression estimates vary over the six cross sections, but they do suggest that, to a significant extent, variation in agricultural productivity is positively associated with variation in primary commodity exports. Hence, agricultural productivity increases stimulate imports of food products and exports onto world markets. These estimates do not permit us to judge the extent to which new imports exceed or lag behind new competitive exports as agricultural productivity changes.

### Imports Versus Exports

Since a change in agricultural productivity among our sample nations is associated with a change in the same direction of both agricultural imports and exports, it is fair to ask which change predominates. Within the context of this study, the approach to that question is not immediately obvious. The various equations discussed above were estimated with logarithmic data on a

Table 5--Cross-section regressions: Agricultural productivity per worker (VAW\*) versus per capita primary commodity exports (XPC\*) in low- and lower-middle-income countries, 1981-86

Year with dependent variable XPC*	Coefficient VAW*	R <sup>2</sup>	Number of observations
1981	1.04 (4.8) <sup>1</sup>	0.36	43
1982	1.02 (3.5)	.27	35
1983	1.42 (6.1)	.52	36
1984	1.27 (4.9)	.43	33
1985	0.89 (4.3)	.25	55
1986	0.93 (4.6)	.28	56

\* = All variables are measured in natural logarithms.

<sup>1</sup>Values in parentheses are t-ratios of estimated coefficients.

Table 6--Cross-section regressions: Agricultural productivity per worker (VAW\*) and manufacturing productivity per worker (VMW\*) versus per capita exports of primary products (XPC\*) in low- and lower-middle-income countries, 1981-86

Year with dependent variable XPC*	Coefficient		R <sup>2</sup>	Number of observations
	VAW*	VMW*		
1981	0.48 (2.0) <sup>1</sup>	0.64 (3.2)	0.46	41
1982	.71 (2.3)	.38 (1.6)	.31	34
1983	1.19 (5.4)	.07 (0.4)	.60	34
1984	.81 (2.5)	.59 (1.9)	.46	32
1985	.60 (2.2)	.42 (1.9)	.27	45
1986	.93 (3.9)	.28 (1.6)	.34	50

\* = All variables are measured in natural logarithms.

<sup>1</sup>Values in parentheses are t-ratios of estimated coefficients.

per person basis so that total trade response to an induced increase in productivity cannot be directly calculated.

However, some additional equations were estimated with the same basic variables measured in actual values so that import versus export comparisons could be made. For this purpose, the cross-section data were pooled for 1984, 1985, and 1986. The first equation estimated with this pooled data is the following:

$$\text{FIC} = 3.888 + 0.038 \text{ VAW} \quad R^2 = .28 \quad N = 154 \quad (4)$$

(7.7)

This is an estimated direct link between productivity and imports. It suggests that a \$1.00 increase in VAW is associated with a \$0.038 increase in per capita agricultural imports. In this pooled set of data, the influence of manufacturing productivity (VMW) on food imports was not statistically significant.

The second equation is the following:

$$\text{XPC} = -0.661 + 0.055 \text{ VAW} + 0.0180 \text{ VMW} \quad R^2 = .24 \quad N = 127 \quad (5)$$

(4.2)                      (3.0)

This equation, not surprisingly, shows that manufacturing productivity is significantly related to agricultural exports along with farm productivity. The estimated coefficient on VAW suggests that an increase of \$1.00 in agricultural productivity is associated with an increase in per capita agricultural exports of \$0.055.



A simple comparison of these two coefficients indicates that the net effect on trade of a change in agricultural productivity is to boost exports more than imports. However, this comparison is not quite appropriate when thinking about effects of these trade changes on U.S. agriculture or, indeed, agricultural trade of the other major developed exporters such as Australia, Canada, and Western Europe. These estimates need to be adjusted for the proportion of both imports and exports that affect the markets in which these traditional export nations compete.

Approximately 64 percent of the agricultural imports and 31 percent of the agricultural exports of developing nations are products which could be drawn from or which directly compete with developed exporters. Hence, a generalized \$1.00 increase in farm productivity in this group of poorer countries will be associated with an approximate increase in relevant farm imports of \$0.025 and an increase in competitive exports of only \$0.017. More detailed analysis could, no doubt, refine these estimates. But these calculations do suggest that the United States and other developed exporters of agricultural products have a positive stake in the agricultural development of the globe's poorer nations.

Specific episodes of trade displacement in some products by some countries can be identified and perhaps associated with agricultural assistance of one kind or another. However, this wider evidence shows that the burden of proof clearly rests with those who insist that agricultural assistance for poor nations is usually a bad thing for American farmers.

### Conclusion

These simple analyses are surely not the last word on these matters. But the lessons are reasonably clear, at least for the low-income nations of the world. A strong case can be made for the idea that advances in agricultural productivity are associated with longrun increases in net imports of cereals and other agricultural products produced by the traditional, developed exporters like the United States. A major part of this case relies on the positive income effect of general economic development. For low- and lower-middle-income countries, investments in agricultural development through successful technical assistance and education are not detrimental to U.S. farm export interests in the long run. They are generally beneficial.

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## Appendix A. Analysis of Middle-Income Countries

This appendix presents a rather brief summary of research conducted by Hugh Maginnis at the University of Minnesota in 1986 and 1987. The master's thesis which resulted from this work is cited in the References.

The group of nations emphasized in this work is the World Bank's middle-income category. It comprises both the lower-middle-income group and an upper-middle-income group. In 1984, the per capita GNP of this entire category ranged from \$450 to \$7,500. The variables employed and the annual cross-section approach was generally similar to that used on the low-income group.

The analysis of the richer countries is important for at least two reasons. First, these are the countries about which much competitive concern has been expressed. These nations are supposedly the clearest examples of what can happen to U.S. agricultural export markets when developing countries become able to produce their own agricultural products. Therefore, it is important to look at them more closely. Second, if economic development proceeds, then some poor countries someday will become richer countries. Hence, it is important to see if there are strong differences in the agricultural trade patterns between poor countries and richer ones. Comparing the observations on the richer countries to the observations on the poorer countries provides a glimpse of the longer term picture of the effects of continued economic development.

Appendix tables 1, 2, and 3 contain regression results for the middle-income category. The logarithmic relationship between per capita GDP and VAW alone is significantly positive (app. table 1). Including VMW as a second explanatory variable weakens but does not eliminate the net relationship. In all cases, both the ability of the productivity measures to explain per capita GDP (indicated by  $R^2$ ) and the relationships themselves are weaker for the middle-income countries as a group than for the low-income classification.

The logarithmic relationship between per capita cereal imports and per capita GDP also is significantly positive. In all cases, both the ability of per capita GDP to explain agricultural imports (measured by  $R^2$ ) and the relationships themselves are weaker for this classification of middle-income countries than they were for the low-income nations.

The logarithmic relationship between per capita exports of primary commodities and VAW alone is significantly positive (app. table 3). Adding VMW as a second explanatory variable generally weakens but does not eliminate this net relationship. In general, the export results shown in appendix table 3 are similar to those for the poorer nations but slightly less strong all around.

Overall, these results suggest that, for countries in the middle-income class, increases in agricultural productivity have slightly less effect on income and, thus, on imports than in poorer countries. Increases in agricultural productivity have a similar relative effect on primary commodity exports in both classifications.

Next, the World Bank's upper-middle-income nations were isolated for annual cross-section analysis, using exactly the same variables and approach. In 1984, these nations exhibited a per capita GNP range from \$1,700 to \$7,500.

Appendix tables 4, 5, and 6 display the regression results for these relatively small annual cross sections. The linkages between agricultural productivity and income and between income and food imports are weaker than with the poorer nations. However, the direct connection between productivity and exports of primary products is stronger in a relative sense. These particular relationships suggest why the opposition to agricultural assistance to nations in the upper-middle-income category is intense and, perhaps, why this opposition tends to spill over against similar aid for poorer nations.

Appendix table 1--Cross-section regression estimates associating agricultural productivity per worker (VAW) and manufacturing productivity per worker (VMW) with per capita income (GDP) in middle-income countries, 1981-84

Year with dependent variable GDP*	Constant term	Coefficient		R <sup>2</sup>	Number of countries
		VAW*	VMW*		
1981	1.54	0.884		.75	48
	(3.27) <sup>1</sup>	(11.89)			
	.88	.74	.23	.78	48
	(1.58)	(7.35)	(2.09)		
1982	1.84	.839		.75	46
	(3.96)	(11.45)			
	1.28	.718	.188	.76	46
	(2.23)	(6.89)	(1.62)		
1983	1.88	.762		.69	44
	(3.50)	(9.59)			
	1.07	.65	.22	.72	45
	(1.71)	(7.63)	(2.33)		
1984	2.40	.676		.66	43
	(4.68)	(8.96)			
	.990	.545	.308	.69	45
	(1.33)	(6.25)	(2.64)		

\* = All variables are measured in natural logarithms.

<sup>1</sup>The t values are in parentheses.

Source: (8).



Appendix table 2--Cross-section regression estimates associating per capita income (GDP) with per capita imports of cereals (CIC) and per capita imports of all food (FIC) by middle-income countries, 1981-84

Year and dependent variable	Constant term	Coefficient GDP*	R <sup>2</sup>	Number of countries
1981:				
CIC*	1.11 (8.1) <sup>1</sup>	0.413 (2.15)	0.85	52
FIC*	-.446 (-.353)	.603 (3.46)	.21	48
1982:				
CIC*	.907 (.67)	.450 (2.41)	.11	48
FIC*	-1.91 (-1.22)	.803 3.74	.27	40
1983:				
CIC*	.809 (.698)	.486 (2.98)	.16	48
FIC*	-2.32 (-1.54)	.835 (3.96)	.26	47
1984:				
CIC*	.906 (.776)	.475 (2.87)	.15	48
FIC*	-2.85 (-1.79)	.90 (4.03)	.29	42

\* = All variables are measured in natural logarithms.

<sup>1</sup>The t values are in parentheses.

Source: (8).

Appendix table 3--Cross-section regression estimates associating agricultural productivity per worker (VAW) and manufacturing productivity per worker (VMW) with per capita exports of primary commodities (XPC) in middle-income countries, 1981-84

Year with dependent variable XPC*	Constant term	Coefficient		R <sup>2</sup>	Number of countries
		VAW*	VMW*		
1981	-1.75	0.938		0.39	37
	(-1.37) <sup>1</sup>	(4.73)			
	-3.38	.547	.581	.46	37
	(-2.36)	(2.09)	(2.15)		
1982	-.064	.670		.22	37
	(-.047)	3.16			
	-.795	.534	.221	.24	37
	(-.483)	(1.96)	(.793)		
1983	-1.62	.883		.41	33
	(-1.24)	(4.66)			
	-1.95	.855	.073	.42	32
	(-1.13)	(3.81)	(.287)		
1984	-.929	.722		.14	43
	(-.486)	(2.57)			
	-.164	.784	-.157	.14	43
	(-.055)	(2.33)	(-.341)		

\* = All variables are measured in natural logarithms.

<sup>1</sup>The t values are in parentheses.

Source: (8).



Appendix table 4--Cross-section regression estimates associating agricultural productivity per worker (VAW) and manufacturing productivity per worker (VMW) with per capita income (GDP) in upper-middle income countries, 1981-84

Year with dependent variable GDP*	Constant term	Coefficient		R <sup>2</sup>	Number of countries
		VAW*	VMW*		
1981	4.77	0.464		0.30	16
	(3.60) <sup>1</sup>	(2.47)			
	5.02	.480	-.048	.30	16
	(1.93)	(1.97)	(-.114)		
1982	4.26	.523		.45	17
	(4.10)	(3.49)			
	3.91	.491	.076	.45	17
	(2.02)	(2.33)	(.223)		
1983	2.59	.681		.35	17
	(1.45)	(2.81)			
	.773	.623	.298	.39	16
	(.282)	(2.32)	(.854)		
1984	5.32	.319		.16	14
	(3.38)	(1.51)			
	5.61	.333	-.05	.16	14
	(1.91)	(1.33)	(-.121)		

\* = All variables measured are in natural logarithms.

<sup>1</sup>The t values are in parentheses.

Source: (8).

Appendix table 5--Cross-section regression estimates associating per capita income (GDP) with per capita imports of cereals (CIC) or with per capita imports of all food (FIC) by upper-middle income countries, 1981-84

Year and dependent variable	Constant Term	Coefficient GDP	R <sup>2</sup>	Number of countries
1981:				
CIC*	6.03 (.756) <sup>1</sup>	-0.215 (-.216)	0.003	18
FIC*	-.386 (-.856)	1.04 (1.86)	.18	18
1982:				
CIC*	-1.74 (-.443)	.81 (1.63)	.13	19
FIC*	-5.87 (-1.32)	1.31 (2.34)	.25	18
1983:				
CIC*	1.89 (.622)	.362 (.918)	.05	18
FIC*	-3.75 (-.913)	1.03 (1.92)	.19	18
1984:				
CIC*	.469 (.116)	.559 (1.08)	.08	16
FIC*	-11.16 (-2.76)	1.94 (3.77)	.522	15

\* = All variables measured are in natural logarithms.

<sup>1</sup>The t values are in parentheses.

Source: (8).



Appendix table 6--Cross-section regression estimates associating agricultural productivity per worker (VAW) and manufacturing productivity per worker (VMW) with per capita exports of primary commodities (XPC) in upper-middle income countries, 1981-84

Year with Dependent variable XPC*	Constant term	Coefficient		R <sup>2</sup>	Number of countries
		VAW*	VMW*		
1981	-5.51	1.45		0.49	13
	(-1.84) <sup>1</sup>	(3.41)			
	-12.58	.953	1.38	.57	13
	(-2.16)	(1.76)	(1.40)		
1982	-4.47	1.30		.47	15
	(-1.75)	(3.55)			
	-4.8	1.27	.069	.47	15
	(-1.01)	(2.46)	(.082)		
1983	-4.85	1.30		.43	12
	(-1.43)	(2.88)			
	-5.63	1.26	.138	.42	11
	(-.975)	(2.30)	(.180)		
1984	-11.09	2.04		.29	12
	(-1.55)	(2.13)			
	-1.78	2.51	-1.61	.34	12
	(-.132)	(2.23)	(-.82)		

\* = All variables are measured in natural logarithms.

<sup>1</sup>The t values are in parentheses.

Source: (8).

## **Agricultural Trade, Self-Sufficiency, and Economic Development**

Gary Vocke<sup>1</sup>

Rising crop and livestock productivity through technological advances (sometimes as a result of foreign assistance) is inevitable as Third World countries develop. There is concern that this enhanced agricultural productivity is reducing potential markets for U.S. agricultural exports.

Developing-country markets for some commodities have disappeared as their agriculture becomes more productive. However, to complete the picture of the effect of improved technology on agricultural trade, the analysis needs to be kept within the framework of agricultural and economic development. New markets appear and grow when rising incomes from economic development transform a potential demand for better diets into actual demand.

Few developing countries can improve their agriculture fast enough to keep up with rapidly rising demand for all the foods in improved diets. These shortfalls have led to growing import markets in many Third World countries.

### **Economic Development Improves Trade Possibilities**

Developing countries are likely growth markets for agricultural exports if their economies are prosperous. The higher income developing countries have become more dependent on imports than the lower income developing countries (fig. 1) (see Appendix for definition of country groupings). The higher income countries shifted from being net exporters to net importers of grains and now import almost 60 percent of the total grain imports by the developing world. The dependence of the lower income countries on imports increased about as fast as their domestic grain production. Their self-sufficiency ratio has fluctuated only slightly since the early 1960's.

The prosperity that has allowed these higher income countries to become large importers has typically been associated with agricultural development. Because agriculture is the largest sector and largest employer in most developing countries, agriculture must develop and become more productive. With increased productivity, resources can be freed for the rest of the economy, allowing the nonagricultural economy to grow faster.

With economic growth comes the higher incomes that, in turn, raise the demand for agricultural products. Often, developing-country agriculture cannot keep up with the demand, or the product cannot be grown economically in the country because of climatic or cropland constraints. Then imports are required. Thus, agricultural incomes and agricultural imports can both rise in developing countries.

During the 1970's, agricultural gross disposable product was increasing most rapidly among the higher income developing countries that were increasing their grain imports so rapidly (fig. 2). It is this potential for growing export markets that needs to be understood when the United States and other

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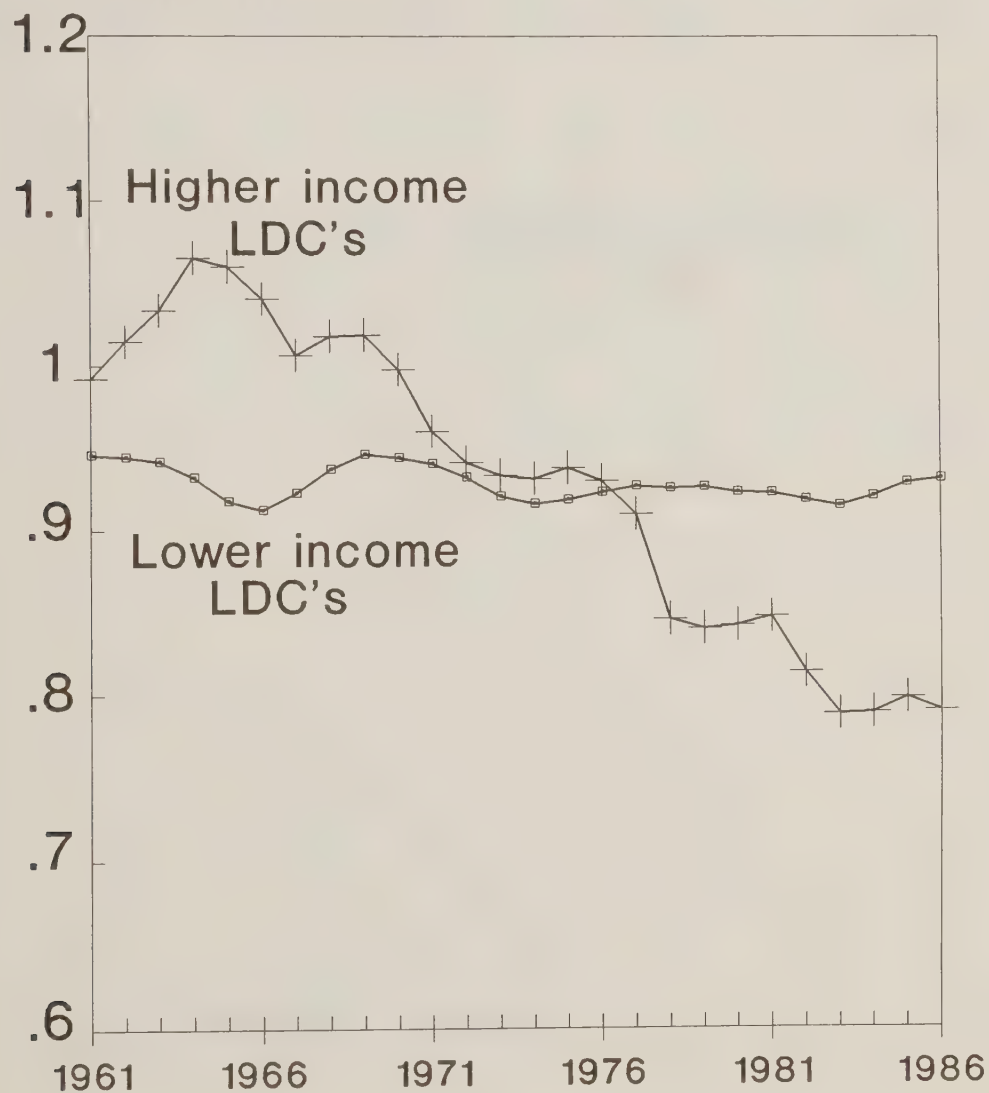
<sup>1</sup>Agricultural economist, Economic Research Service, U.S. Department of Agriculture.



Figure 1

## Higher income LDC's are more dependent on grain imports

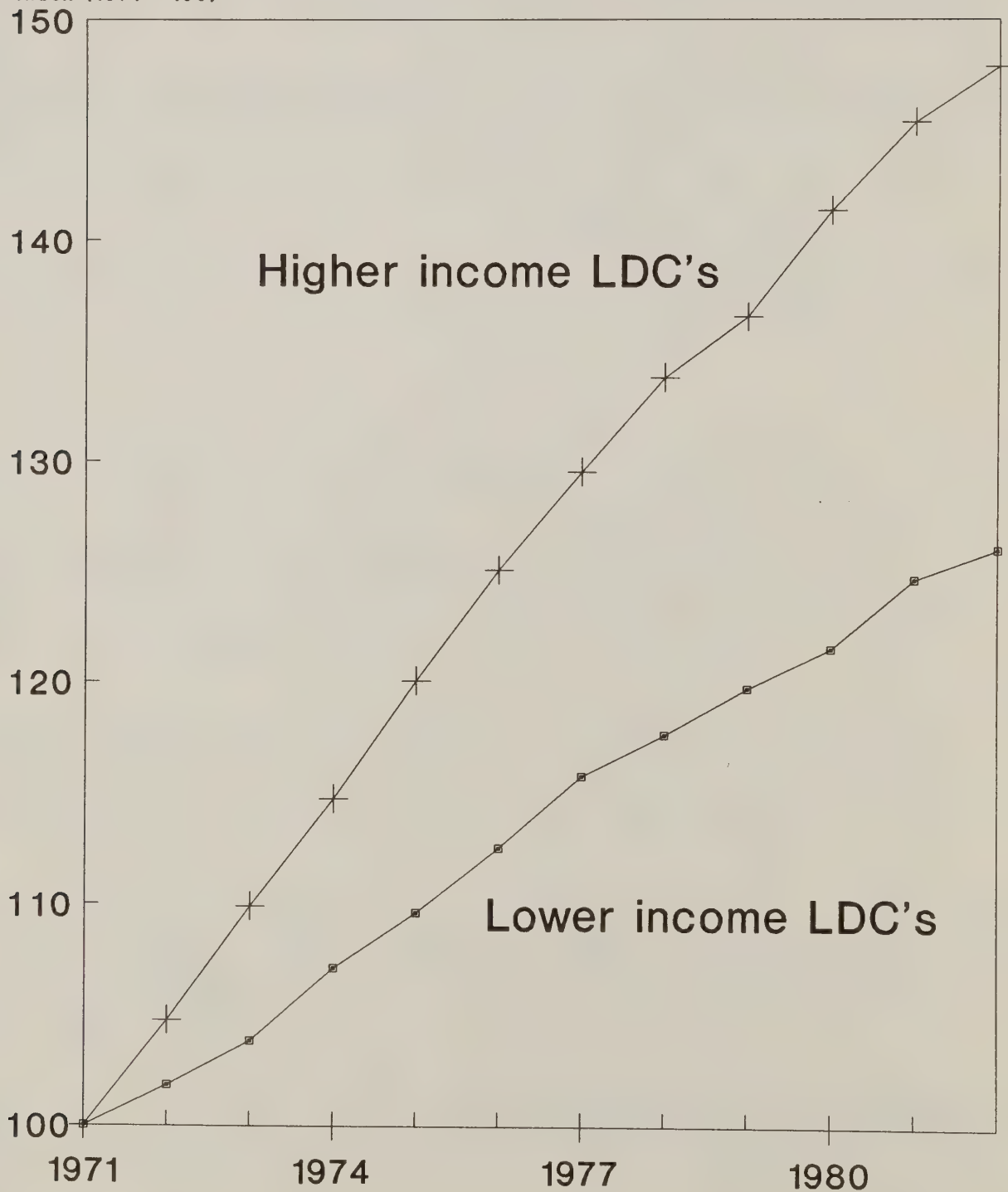
Ratio (1 = self-sufficiency)



The ratio is grain production divided by the sum of grain production plus net imports.

Figure 2  
Agriculture's gross domestic product  
growing faster in higher LDC's

Index (1971 = 100)





industrial market countries consider their development assistance policies and programs for low-income countries. Import markets come with prosperous economies.

#### The Green Revolution Lags Rising Wheat Consumption in the Developing World

Rising incomes and increasing urbanization explain much of the rapidly increasing wheat consumption in developing countries (4).<sup>2</sup> Wheat consumption is usually higher in urban areas than in rural areas, so the migration to the cities is increasing the demand for wheat. Wheat consumption also tends to rise with incomes, usually at a faster rate than for other staples. The positive association between increasing wheat consumption and rising incomes also reflects substitution of wheat for other starchy staples.

Where there is rapidly rising demand for food grains, many countries have turned to wheat imports, sometimes even at the expense of their own agriculture. Imports for urban consumers help overcome bottlenecks in domestic transportation, limited rural storage, year-to-year fluctuations in supplies, and problems of quality control, especially with other grains such as sorghum. In Sub-Saharan Africa, for example, the major capitals are growing at an average annual rate of 9 percent. If these cities were to depend on domestic supplies, transportation and storage capacity must double every 8 years simply to maintain per capita consumption (4). Thus, many developing countries find it easier to import wheat than to supply their cities with food from rural areas.

Food aid, usually wheat, has helped increase consumer preferences for wheat products. In addition, wheat products based on imported wheat are often less expensive relative to other grains because of government policies.

A few countries have met their rising demand for wheat with dramatic increases in domestic output, commonly referred to as the green revolution for wheat. Researchers at the International Maize and Wheat Improvement Center (CIMMYT) in Mexico developed short-stemmed, high-yielding wheat varieties in the 1950's by crossing Mexican varieties with American semidwarf varieties (developed in the 1940's at Washington State University using varieties from Japan).<sup>3</sup> The semidwarf varieties proved well adapted in the spring wheat growing countries in the Third World (15). High-yielding wheat varieties have spread to about 60 percent of the wheat area in the Third World (5). When grown using recommended practices, including irrigation, the semidwarf varieties increased yields two and three times above those of native varieties in response to heavy fertilization. These improved varieties have enabled some countries to greatly increase wheat output (fig. 3).

Progress with rice has also helped to reduce food grain imports of some countries. Researchers at the International Rice Research Institute (IRRI) in

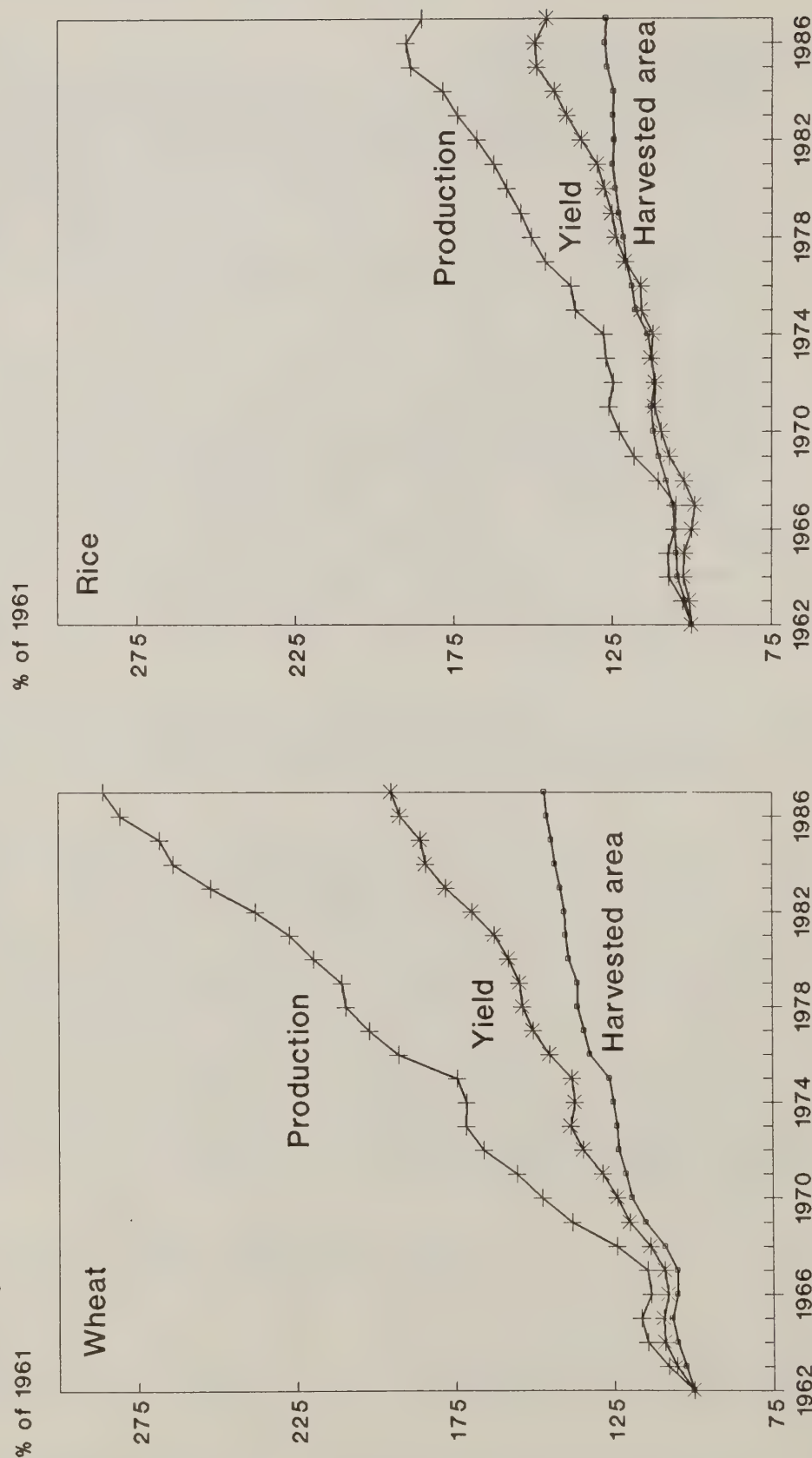
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<sup>2</sup>Underscored numbers in parentheses are listed in the References at the end of this paper.

<sup>3</sup>CIMMYT and International Rice Research Institute (IRRI) are institutions in the Consultative Group for International Agricultural Research (CGIAR). These institutions are funded with foreign assistance from various governments, including the United States, and private donors.

Figure 3

# Third World wheat production growing faster than rice production\*



\*Data are 3-year averages centered on middle year.



the Philippines developed a short-season, short-stemmed rice variety during the 1960's by crossing an Indonesian variety with a semidwarf from Taiwan. Its good response to improved soil fertility under irrigation encouraged farmers to fertilize it heavily, greatly increasing production. In addition, because its maturity was not controlled by day length as with traditional varieties, it could be counted upon to mature within a certain number of days (almost half the number of days of many native varieties). This insensitivity to day length and short growing season boosted multiple cropping and total production of rice in many countries. About 40 percent of the rice area in the developing countries is in high-yielding varieties (4).

The effect of these improved varieties on trade was particularly striking in India and Indonesia, which were once the Third World's largest importers of wheat and rice. Both countries promoted these varieties with subsidized inputs and high support prices as part of their national food security programs. They achieved self-sufficiency in just a few years. As these countries reduced their imports, governments reduced incentives for wheat and rice production so as to avoid producing surpluses of subsidized grain that would have to be exported at a loss.<sup>4</sup> These countries are expected to fluctuate around self-sufficiency in these grains, depending on weather and changing government policies. Both countries have recently imported grain.

Sometimes opposing trends can be seen in one country. The rising incomes and increasing urbanization in Indonesia led to a greater demand for wheat, which could only be met by imports because Indonesia's climate is not suited for wheat production. Indonesia's annual imports of wheat and wheat products have risen from 20,000 tons in the mid-1960's to 1.6 million tons in 1987/88 (fig. 4).

The aggregate trade result for the food grains of wheat and rice has been a slight trend toward increased dependence of the Third World on imports (fig. 5). The lost markets in a few countries have been more than offset by the growth of new markets in other countries, especially for wheat because, unlike rice, it is not a suitable crop in both tropical and temperate climates (14). Wheat imports by developing countries have grown 100 percent since the early 1960's even though wheat output in the developing world has risen more than 150 percent.

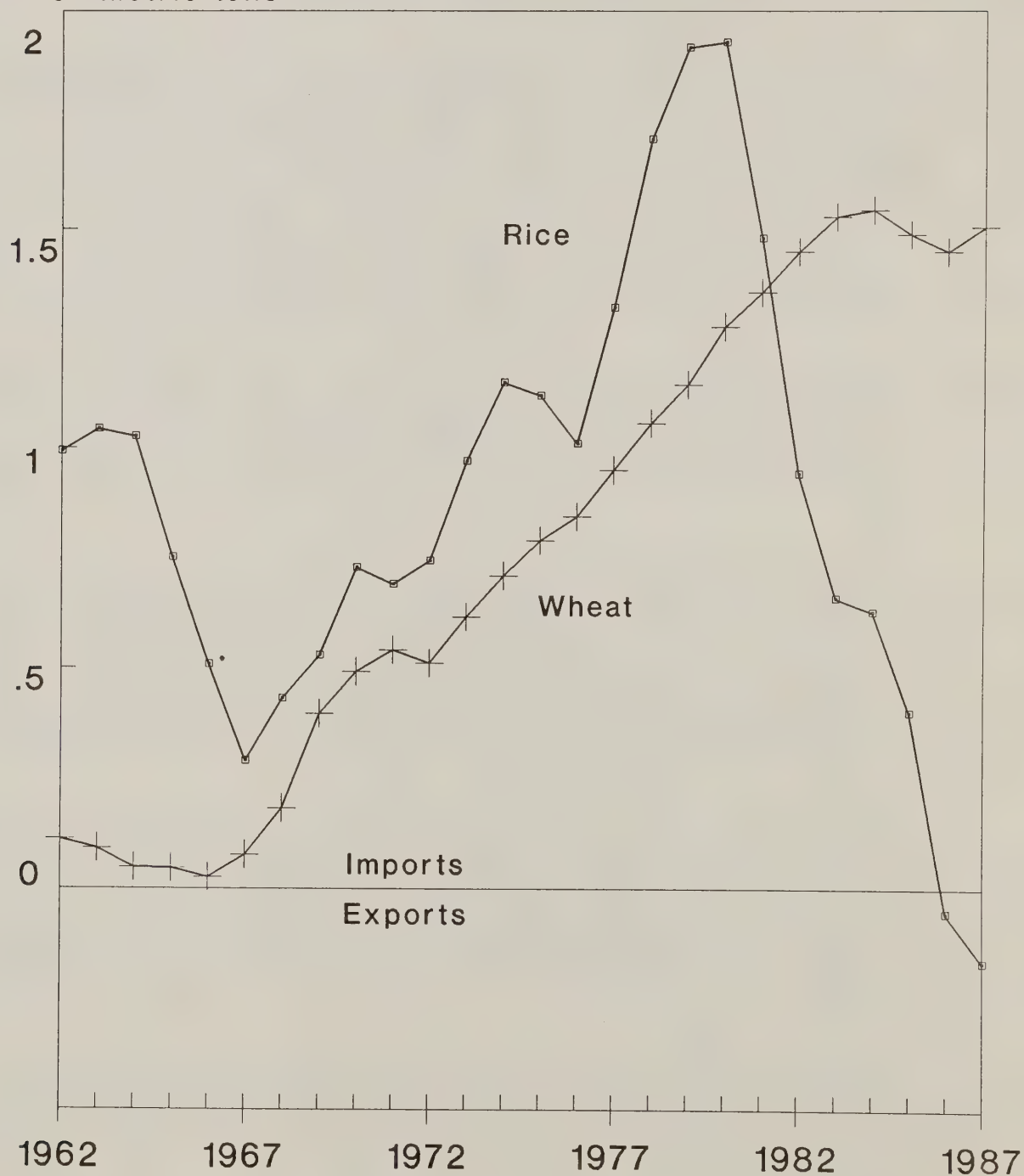
For the coarse grains of corn and sorghum, the trend of increasing dependence on imports is much steeper. Extending these self-sufficiency trends into the future dramatizes the differences between the two commodity groups. Although part of the explanation for the steeper trend for corn and sorghum compared with the food grains lies with their slower rate of productivity improvement compared with wheat and rice, the trend for coarse grains is highly dependent on rising incomes.

As developing nations prosper, the consumer demand for meat increases. As long as the market for meat is small, this growing demand can be efficiently supplied by increasing traditional livestock production or by imports. As

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<sup>4</sup>It is important to remember that just because a country has eliminated its food imports does not mean that none of its people are hungry. India, for example, still has millions of undernourished people, and the potential demand far exceeds current production. Given a higher annual income than at present (\$270 per person), India's trade position could change drastically.

Figure 4  
 Indonesia reduced its rice imports by  
 boosting production, but could not do  
 the same with wheat, a nontropical crop\*  
 Million metric tons

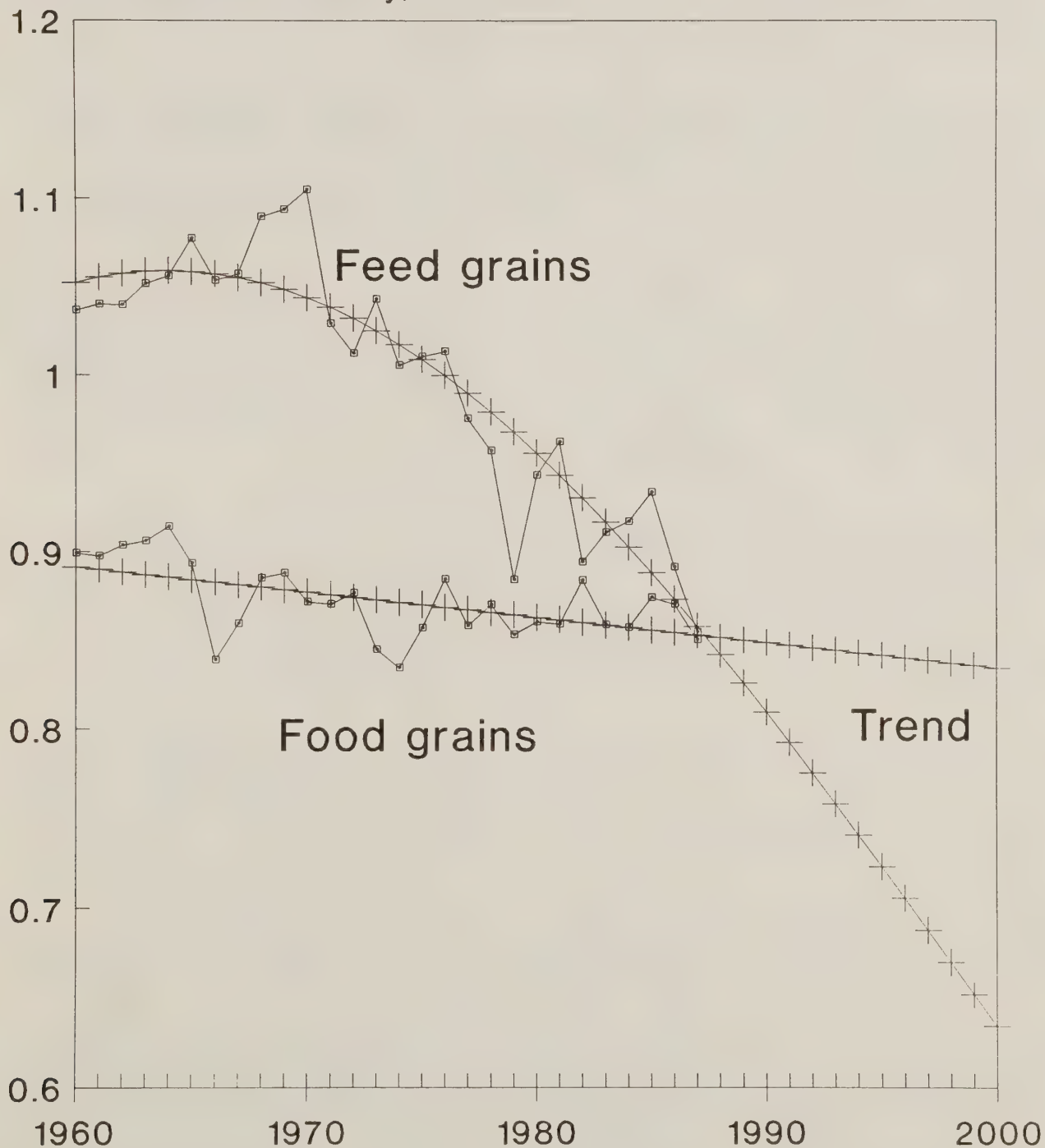


\*Data are 3-year averages centered on middle year.

Figure 5

## Developing countries are becoming less self-sufficient in grains

Ratio (1 = self-sufficiency)



Ratio is grain production divided by the sum of grain production and net imports.



demand grows, local entrepreneurs will begin producing grain-fed chicken and pork in modern confinement units using technology easily imported from developed countries.

The development of these livestock industries is driven by consumer demand for fresh meat. In some cases, governments facilitate this transfer of technology and subsidize livestock production to promote economic growth and employment.

These production systems, including feed manufacturing, for converting crops into animal products are independent of pastureland, climate, and even the cropland to grow grains. The grain can be imported.

The trade consequences of these livestock/feed technology transfers vary by country. Some countries have abundant cropland for growing feedstuffs. Examples include soybeans in Brazil and corn in Thailand. The transferred livestock production technology allows these countries to add value to domestic crops through livestock. As these countries with exportable grain or soybeans expand livestock production, less of their crops will be sold in world markets (fig. 6).

For countries lacking sufficient cropland, increased grain-fed meat production creates import markets for feedstuffs. For example, Malaysia's rising income raises demand for livestock products. Its livestock sector is now 15 percent of national agricultural output. Because Malaysia's cropland and climate are not suitable to grow the needed crops, the country must import most of its feed needs of corn and soybean meal.

Countries like Malaysia, the arid countries of the Middle East, and the land-scarce countries of the Far East, then become linked into a global trading economy from intermediate inputs through to the final product. With broilers, for example, the process begins with the grain and soybean farmers and poultry breeders owning the superior genetic stock. Their crops and breeding stock are easily transported almost anywhere to supply feed manufacturing and hatching egg operations of integrated broiler firms.

Because livestock and feed technology is not tied to land and climate as are crops, these systems are more widely transferable. The trade consequence of this transferability is that countries whose superior technology gives them an advantage in the export of animal products can easily lose that advantage as the technology is transferred by the private sector (11).<sup>5</sup>

Suppliers of this technology for grain-fed intensive livestock production are available in many developed countries. If U.S. firms do not sell this technology to Third World countries, firms in the other countries will supply the market. The transfer of this technology is inevitable.

Thus, empirical studies have shown a strong, positive relationship between per capita income and the use of cereals as feed (7, 8). The rapidly increasing demand for feed has now raised feed use of corn and sorghum to equal food uses (fig. 7). Over two-thirds of the grains used for feed in the developing countries are fed to poultry and swine (2).

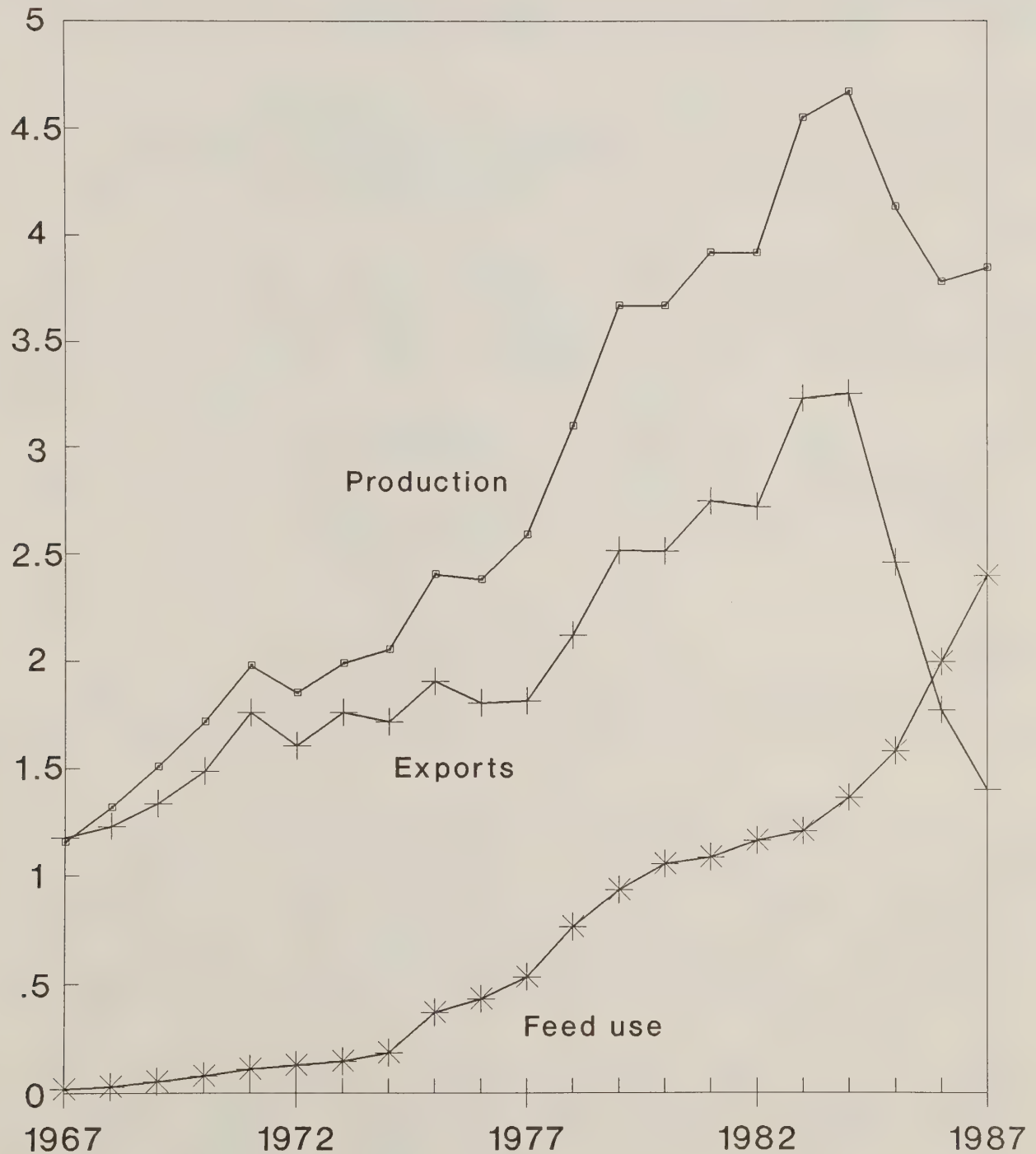
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<sup>5</sup>From a wider perspective, the livestock and feed technology transfer creates nonagricultural jobs and earns foreign exchange for the technology-exporting country.

Figure 6

Thailand's corn exports have decreased as use of corn for livestock feed has increased\*

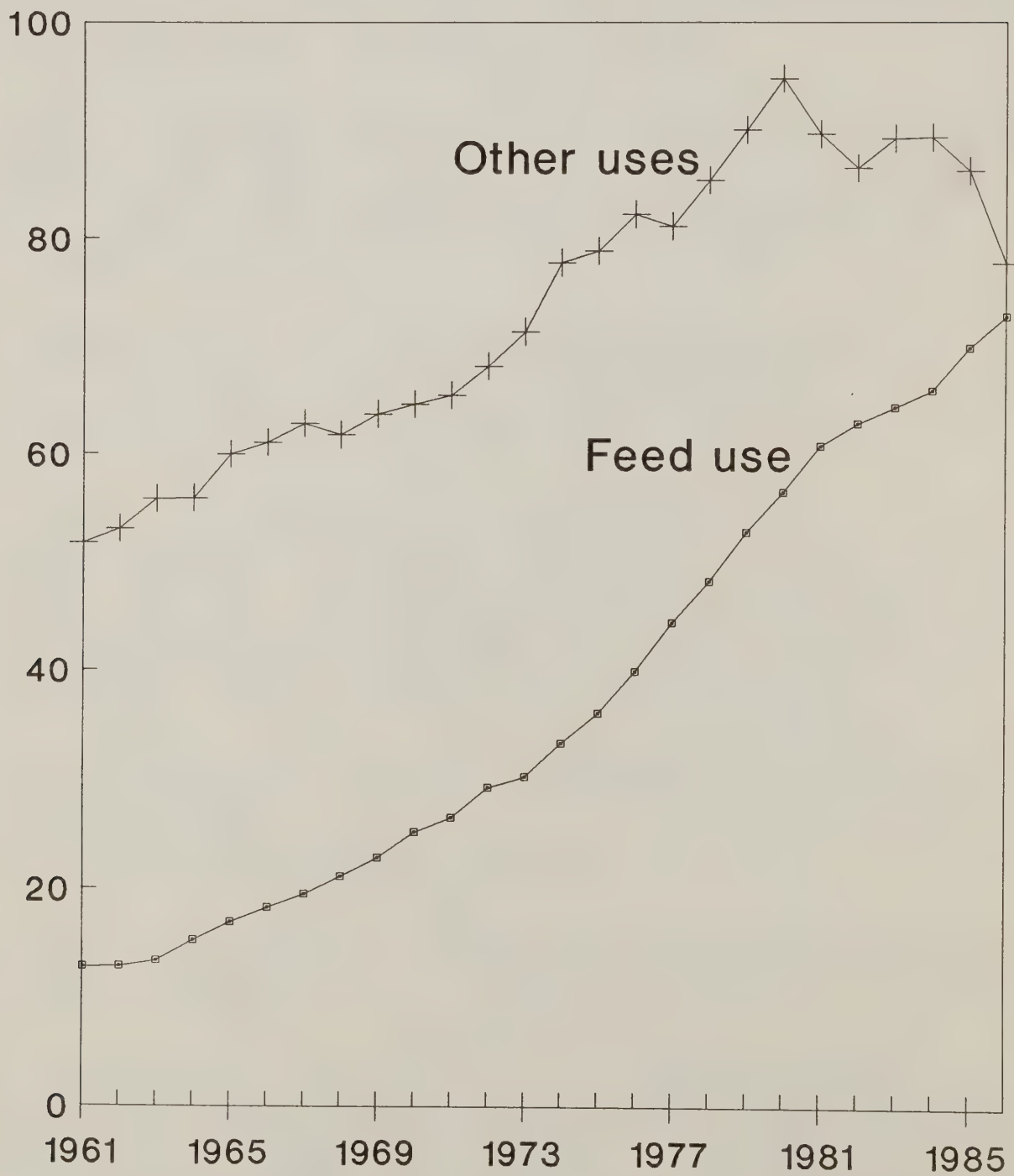
Million metric tons



\*Data are 3-year averages centered on middle year.

Figure 7  
Third World feed use of corn and  
sorghum now equals other uses\*

1,000 metric tons



\*Data are 3-year averages centered on middle year.



Growth of broiler production has been particularly strong, with more feed-efficient birds, intensive poultry production units, and associated feed manufacturing (9). In many countries, feed needs have grown faster than domestic production, necessitating imports despite the increasing use of improved varieties in some Third World countries (10).

About half of the corn area in developing countries is now planted to improved varieties (3). The improved varieties were developed through breeding programs in each country. Although corn can be grown under a wide range of environments from the tropics to temperate-climate countries, when varieties are transferred from one environment to another performance falls.

Corn production has increased faster than sorghum (fig. 8). The overall rate of improvement in yields has been about equal since the 1960's, but the trend differs. Corn yields have steadily increased since the early 1960's in Latin America and Asia. Sorghum yields jumped sharply in the early 1970's when hybrid varieties were introduced in Mexico, Argentina, and India (12).

In the 1950's, commercial hybrid sorghums were developed by U.S. researchers. When yield trials showed that U.S. sorghum hybrids performed well in Mexico and Argentina, U.S. seed companies were quick to market these hybrids in those countries. Sorghum output increased rapidly in Mexico but lagged behind the growth of their livestock industry. The country remains a large importer of sorghum to feed livestock.

In Argentina, sorghum output exceeded domestic needs, and the surplus is exported. Crops that grow well in the United States also grow well in Argentina. Because the country is sparsely populated, there will likely be surpluses for export. This has long been the case for cereal grains, and is now true for soybeans as well.

#### Production of Soybeans for Export Increases Rapidly

While soybeans are a traditional food crop in East and Southeast Asia, they are a relatively new crop elsewhere. Outside of Asia, soybean production expanded first in the upper Midwest of the United States, then in the Southern United States, and now in South America (13).

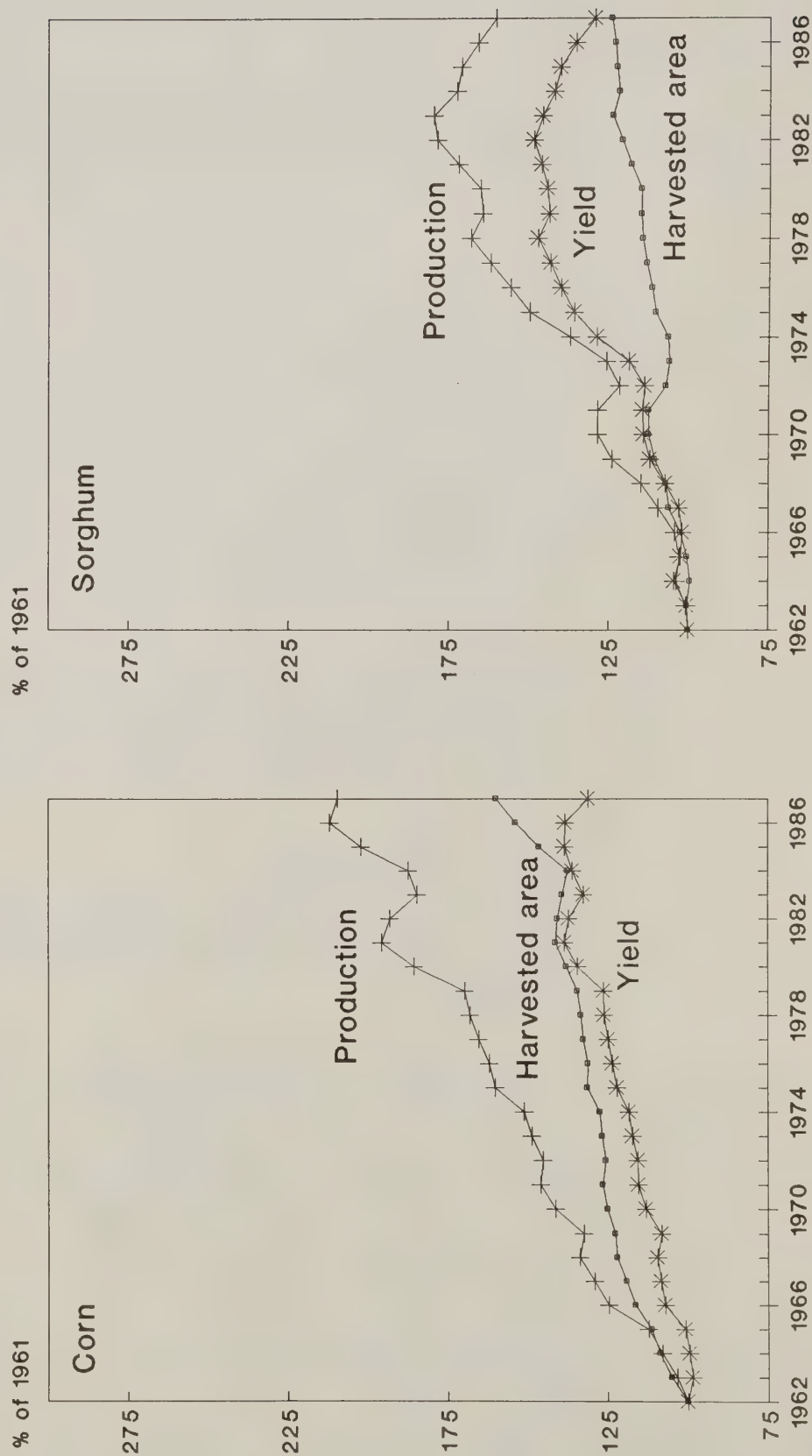
Transferred East Asian soybean varieties grew well in the upper Midwest of the United States because of similar temperate climate and day length. The United States developed efficient technology for extracting oil from the soybean seed and processing it to prevent undesirable off-flavors, making it a useful and low-cost edible oil. U.S. research in feeding soybean meal to livestock and poultry combined with rising demand for meat and poultry products to create large markets for soybean meal in the United States and overseas. U.S. production and exports dominated these markets in the 1950's and 1960's.

Breeders developed soybean varieties suitable for the day lengths of the Southern United States. These varieties were also suitable for the temperate areas of Brazil and Argentina, and when soybean prices rose in the early 1970's, their plantings expanded greatly.

Brazil and Argentina export soybean products. Their processing of soybeans into oil and meal has been facilitated by the transfer of large-scale processing equipment by multinational grain companies. Brazil and Argentina

Figure 8

# Third World corn output continues expanding while sorghum stagnates\*



\*Data are 3-year averages centered on middle year.

captured a large share of world soybean trade from the United States following this transfer of soybean varieties and processing technology (fig. 9).

However, it is difficult to transfer high-yielding U.S. varieties to the tropics of the Third World because most U.S. soybean varieties flower too soon in the tropics for good yields.

The research effort required to develop new varieties and growing practices for the tropics is demonstrated by the experience of Brazil to extend its soybean production into its tropical areas. Brazil has had to create a soybean research organization with 300 full- and part-time scientists. Few developing countries are wealthy enough to devote so many scientists and the associated facilities and operating budgets to one crop. In comparison, the United States has about 350 people involved in soybean production research and development.

#### Factors Other Than New Technology Also Important

The level of farm prices is crucial to increasing agricultural output. Many Third World countries have held down agricultural commodity prices for the benefit of their consumers. This situation differs somewhat from the experience of many developed countries, including the United States, where food prices were lowered through new production technology and infrastructure investments, such as roads and railroads, to reduce transportation costs. When governments reduce urban consumer food prices by decree only, the resulting lack of incentives for local farmers can restrain production.

For example, according to the International Monetary Fund (IMF), there is evidence that if real farm prices are raised by 10 percent, aggregate output would increase 2-5 percent in the long run in the poorer countries and 6-9 percent in the more advanced developing countries (1).

Infrastructure and public services are also important; the IMF reports evidence that agricultural output increases by as much as 10 percent with a 10-percent increase in public goods and services (1). In the more advanced developing countries where infrastructure is better, the response is smaller.

Foreign capital can help make the large investments, both public and private, needed for rapid economic progress. Developing countries generally have an abundance of low-cost labor and natural resources but lack the capital needed to develop these resources.

Foreign aid has a role with this development of the economic resources, including technical assistance to increase agricultural productivity. With increased productivity, resources can be freed from agriculture for the rest of the economy, allowing nonagricultural incomes to grow more rapidly. The rapid growth of incomes generally has created markets for agricultural products.

#### **Summary**

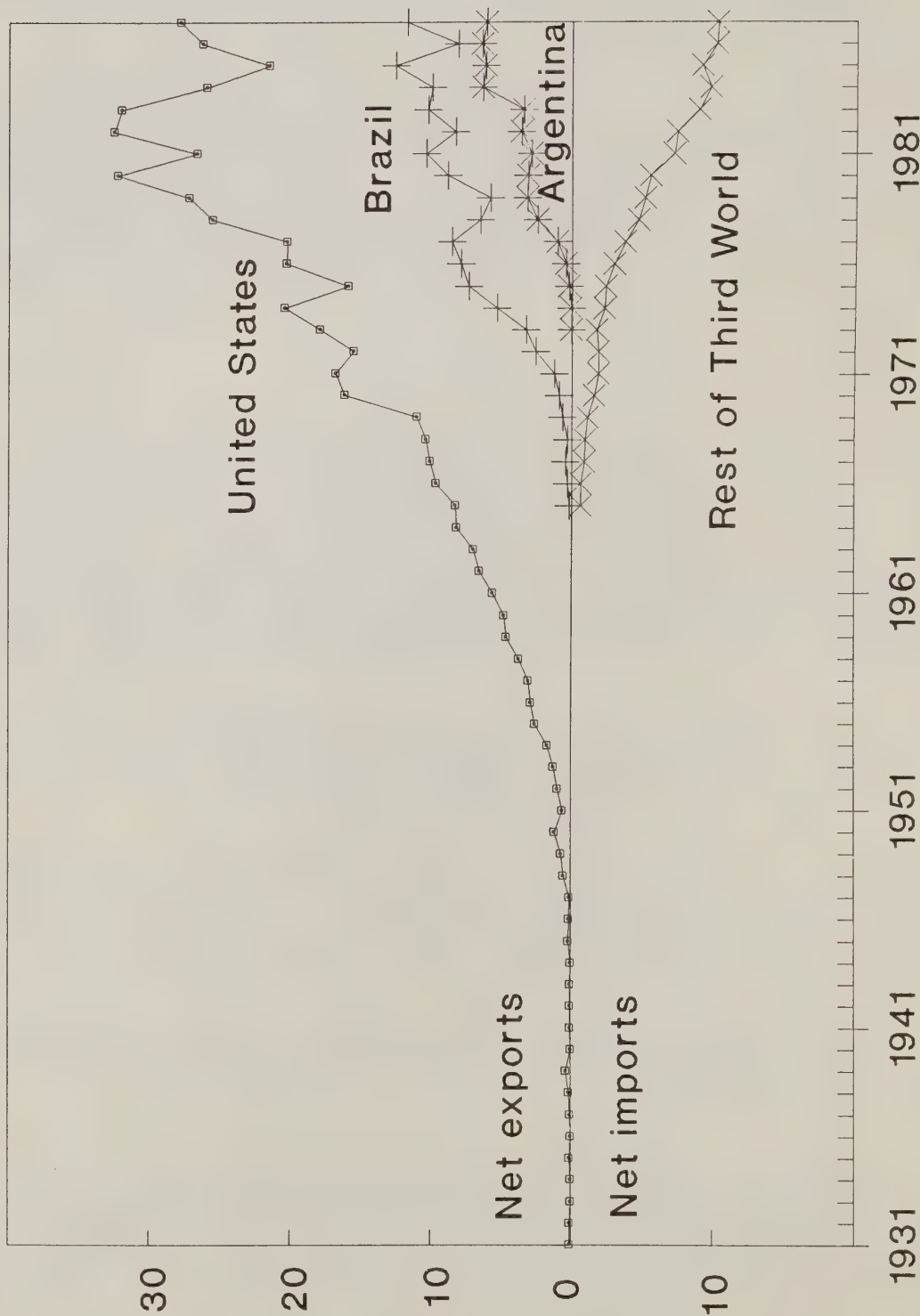
Improved crop varieties provide the rising productivity needed for economic growth in many Third World countries. The increased output can also directly affect trade (table 1). Imports of some commodities will decline as countries raise yields and output of crops that they are well suited to grow. If production exceeds domestic needs, the surplus will be exported. However,



Figure 9

# Soybean and soybean product trade of the United States and the Third World

Million tons



import markets do not always disappear and new import markets have opened as rising income from economic growth creates a demand for commodities not well suited for local production.

Economic growth also promotes the use of improved technology. The higher incomes that come with economic growth shift diets, creating demands for new products. In particular, the shift to more animal products in diets as incomes rise has prompted a rapid expansion of intensive livestock production in higher income Third World countries. This growth has been facilitated by the transfer of modern technology from developed countries. The feed needs of these livestock industries have frequently outpaced domestic production, creating growing import markets.

Table 1--Agricultural production technology for Third World

Commodity	Spread of new technology in Third World	Trade consequences for the United States
Food grains:		
Rice	Semidwarf varieties spread rapidly in irrigated areas. Besides raising yields, they boosted multiple cropping because of their short growing season.	Imports by major importing countries declined. Thailand, the major exporter, uses some HYV's (13 percent) (5), but their spread has been limited to irrigated areas.
Wheat	Original semidwarf varieties spread rapidly in irrigated spring wheat-growing countries. Researchers are improving other types of wheat. However, varieties have not been developed for the tropics.	Export competition from Argentina increased. Imports by spring wheat countries declined. Increased imports by the rest of the Third World were greater than these lost markets.
Coarse grains:		
Corn	High-yielding varieties have been developed for many locations but have proven difficult to transfer to other environments. Where corn is consumed directly, taste and color differences also limited transferability.	Export competition from Argentina and Thailand based on widespread use of improved varieties, 100 and 70 percent, respectively (3). Feed use is outpacing production in higher income countries, causing their imports to increase.
Sorghum	U.S. varieties transferred to Argentina and Mexico as feed grain crop. U.S. varieties are not useful where sorghum is a food grain because the taste and color is not acceptable.	Argentina competes with the United States to supply livestock feed markets.
Oilseed crops:		
Soybeans	Southern U.S. varieties were transferred to Brazil and Argentina. Brazil is now extending its area of production by developing tropical varieties. (U.S. varieties are not suitable for the tropics.)	Export competition from Brazil and Argentina was facilitated by the transfer to processing equipment from developed countries. Imports by other countries are increasing.
Livestock:		
Broilers	Spread of modern technology is not limited by climate and land. Substantial foreign exchange is needed to import the technology.	Because the technology is easily transferred, modern broiler industries are established where there is demand, often creating grain import markets. Sometimes the increased broiler production replaces imports of chicken meat.



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## Appendix

The higher income countries, with 5 billion people, include the petroleum exporting countries (OPEC), with per capita incomes between \$7,200 and \$19,300, and the newly industrializing countries (NIC's), with per capita incomes from \$1,600 to \$7,500 (app. table 1).

OPEC, the highest income group, needs a stable and prosperous world market for its oil exports and a favorable international economy in which to invest its export earnings. Despite their relatively small populations, their grain imports account for 13 percent of the imports by the developing world.

Among the NIC's, farming provides jobs for 15-35 percent of the workforce and generates about 10 percent of their gross national product (GNP). Further economic development depends on a strong international economy with few trade barriers for their exports. However, debt problems jeopardize the economic prospects of some of these countries, especially those in Latin America.

The lower income countries, with 2 billion people, include the low-income countries, with per capita incomes up to \$400, and the middle-income countries, with per capita incomes ranging from \$400 to \$1,600.

In countries where per capita income is less than \$400 per year, economic aid is needed. These countries are primarily agricultural, with 70-90 percent of their workforce in farming. Farming generates almost 40 percent of GNP. Many of the 1.4 billion people in these countries live in subsistence agricultural economies that often lack basic physical, educational, and social infrastructures. These low-income countries import less than 10 percent of Third World grain imports, despite having half of the population. They do not produce much for export, so there is little money for commercial imports. Food imports are sometimes donations in the poorest of these countries. These countries also need foreign capital if they are to begin to climb up the economic development ladder that will eventually lead to commercial markets for U.S. agriculture.

For countries with incomes above \$400, progress is being made but many of their 675 million citizens are still impoverished. Farming employs 40-70 percent of the workforce and provides 20 percent of their GNP. Some of these countries need foreign aid and all need foreign capital for their economies to prosper.

Appendix table 1--Classification of developing countries

Higher-income countries		Lower-income countries	
High-income OPEC	Newly- industrializing	Middle-income	Low-income
Kuwait	Algeria	Bolivia	Bangladesh
Libya	Argentina	Cameroon	Benin
Oman	Brazil	Colombia	Burkina Faso
Saudia Arabia	Chile	Costa Rica	Burma
	Hong Kong	Dominican Rep.	Chad
	Iran	Ecuador	Ethiopia
	Iraq	Egypt	Ghana
	Israel	El Salvador	Guyana
	Jordon	Gabon	Haiti
	Malaysia	Guatemala	India
	Mexico	Honduras	Kenya
	Panama	Indonesia	Madagascar
	Rep. of Korea	Ivory Coast	Malawi
	Singapore	Jamaica	Mali
	South Africa	Lebanon	Mauritius
	Syria	Liberia	Mozambique
	Trinidad	Mauritania	Nepal
	Uruguay	Morocco	Niger
	Venezuela	Nicaragua	Pakistan
		Nigeria	Rwanda
		P. New Guinea	Sierra Leone
		Paraguay	Somalia
		Peru	Sri Lanka
		Philippines	Sudan
		Senegal	Tanzania
		Taiwan	Togo
		Thailand	Uganda
		Tunisia	Zaire
		Turkey	
		Yemen Arab Rep.	
		Zambia	
		Zimbabwe	



# Effects of Agricultural Growth in Developing Countries on Agricultural Imports, Particularly From the United States: Policy Implications

Earl D. Kellogg<sup>1</sup>

An important question to emerge in the United States over the past few years is whether providing agricultural development assistance to developing countries is in the best interests of American agriculture. The concern is that increasing agricultural production in these countries contributed substantially to the decline in U.S. agricultural exports from 1981 through 1986. This paper considers the basis for this recent concern and briefly examines the evidence and data relevant to it. In addition, it discusses why U.S. agricultural exports have declined over the past 5 years, examines more closely the relationship between increasing agricultural production in developing countries and those countries' demands for agricultural imports, and concludes with a few comments about development assistance that might reduce potential conflicts with U.S. agricultural interests.

## Why Agricultural Assistance to Developing Countries Has Recently Become an Issue

Although the possible inconsistency between supporting agricultural development in poor countries and increasing U.S. agricultural exports has been potentially troublesome since agricultural development assistance began several decades ago, it has become a big issue only recently. Three reasons can account for this.

First, international and foreign phenomena are having increasing influence on U.S. agriculture (13).<sup>2</sup> For example, large international capital flows affect U.S. interest rates, exchange rates, and help finance U.S. budget deficits. All these variables affect U.S. agriculture. The floating exchange rate of the U.S. dollar alone frequently changes prices of U.S. agricultural exports and imports. The influence of global phenomena on U.S. agriculture has also increased because of the substantial increases in the value of U.S. agricultural exports and imports between 1960 and 1987, by 503 and 414 percent, respectively (table 1). Finally, the proportion of U.S. agricultural exports going to various country groups has changed. In 1975-77, an average of 31.7 percent of all U.S. agricultural exports went to less-developed countries (LDC's), 59.6 percent went to developed countries, and 8.6 percent went to centrally planned economies. The same proportions in 1985-87 were 41.1, 52.4, and 6.5 percent, (table 2).

A second reason lies with the growing visibility of U.S. universities (and other institutions supported by U.S. funds) in implementing projects designed to improve agricultural production in developing countries. Legislation in Title XII of the Foreign Assistance Act created a distinct mandate for U.S. universities to be involved in these projects giving rise to small but

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<sup>2</sup>Underscored numbers in parentheses are listed in the References at the end of this paper.

Table 1--Value of U.S. agricultural exports and imports, by fiscal year

Item	1960	1970	1987	1960-87 increase
<u>--Million dollars--</u>				<u>Percent</u>
Exports	4,628	6,958	27,900	503
Imports	4,010	5,686	20,600	414

Source: (17).

Table 2--Value of U.S. agricultural exports, 1975-87

Year	Total value	To developing countries	Share to developing countries	To centrally planned countries	Share to centrally planned countries	To more developed countries	Share to more developed countries
	<u>--Billion dollars--</u>		<u>Percent</u>	<u>Billion dollars</u>	<u>Percent</u>	<u>Billion dollars</u>	<u>Percent</u>
1975	21.9	7.5	34.2	1.8	8.2	12.6	57.5
1976	23.0	6.8	29.5	2.4	10.4	13.8	60.0
1977	23.6	7.4	31.3	1.7	7.2	14.5	61.4
1978	29.4	9.7	33.0	3.4	11.5	16.3	55.4
1979	34.7	10.8	31.1	5.8	16.7	18.1	52.1
1980	41.2	14.6	35.4	5.4	13.1	21.2	51.4
1981	43.3	16.0	37.0	5.3	12.2	22.0	50.8
1982	36.6	12.9	35.2	4.2	11.5	19.5	53.2
1983	36.1	14.4	39.9	2.9	8.0	18.8	52.0
1984	37.8	15.0	39.7	4.2	11.1	18.6	49.2
1985	29.0	12.0	41.4	2.6	9.0	14.4	49.6
1986	26.2	10.8	41.2	1.2	4.6	14.2	54.2
1987	28.6	11.6	40.5	1.7	6.0	15.3	53.5

Source: (17).

identifiable international sections in many institutions, and State clientele are raising questions about such international activities.

Third, for a number of reasons, farm organizations have more actively questioned development assistance in agriculture during the mid-1980's than in previous decades. This is partly because U.S. farm problems affecting farmer net income and net worth positions became more severe from 1982 to 1986. During this time, many farmers faced declining asset values, heavy debt burdens, high interest rates, low product prices, and reduced export sales (table 2). Stowe believes that farm organizations oppose certain activities related to development assistance in agriculture for additional reasons other than perceived negative economic consequences (14). These reasons include (1) political conceptions about the proper role of the state in economic affairs, (2) strong views about nationalism and internationalism, (3) internal organizational imperatives such as reinforcing the perception of members and potential members that the organizations are providing benefits to members, and (4) commodity-specific concerns about the consequences of development assistance programs.

## **Has Increased Agricultural Production in Developing Countries Caused U.S. Agricultural Exports To Decline**

If increased agricultural production in developing countries has been the reason for the decline in U.S. agricultural exports, one or more of the following conditions would also have to exist:

- o Significant increases in total and per capita agricultural production in LDC's because U.S. agricultural exports began to decline in 1980-81;
- o Increases in agricultural exports of LDC's; or
- o Significant reductions in total agricultural imports by LDC's.

Regarding the first point, from 1980-81 to 1985-86, total agricultural production in LDC's increased only 2.7 percent per year (16). Further, per capita agricultural production in these countries has remained essentially constant since 1980-81. Only in Southeast Asian LDC's did it increase substantially in the past decade. Preliminary estimates for 1987-88 indicate the indexes for total and per capita production for LDC's will be lower than in 1985-86. Thus, because LDC regions in general have shown little or no improvement in per capita agricultural production in the later 1980's versus the early 1980's, they have apparently undergone no widespread boom in agricultural production to have caused the volume of their agricultural imports to decline.

As to possible increases in agricultural exports of LDC's, developing countries accounted for 35 percent of the world's agricultural exports in 1965-67, whereas in 1982-84 that proportion declined to 30 percent (19). Overall, agricultural exports by LDC's during the 1980's have been steady to declining. Therefore, developing countries, in general, have not been taking away U.S. agricultural export markets. On the contrary, LDC's are losing agricultural export market shares, not increasing them.

Finally, far from being reduced, the value of developing countries' agricultural imports from 1974 to 1984, in fact, increased by 141 percent. For the last 4 years of that period, however, their value declined by 8.9 percent. Moreover, if measured from 1982 to 1984, the value of those imports decreased by only 3 percent (3). In addition, from 1980-81 to 1984-85, when their value was falling, the volume of agricultural imports by developing countries actually increased by 7.1 percent (3). The self-sufficiency ratio in developing countries for food grains is below 1 and declining slowly, while for coarse grains, the self-sufficiency ratio is below 1 and declining more rapidly (11).

Apart from these points, it should be noted that from 1968 to 1983, the developed world, excluding the United States, increased its market share of LDC agricultural imports from 27 to 37 percent. The U.S. market share during the same period, however, decreased from 32 to 27 percent (19). Therefore, the United States has lost some of its share of the LDC agricultural import market to other developed countries.

In summary, then, there has been no major increase in per capita agricultural production in LDC's in the 1980's. The share of world agricultural exports



accounted for by LDC's is declining, not increasing. In addition, although LDC's agricultural imports have been declining slightly in value in the 1980's, they have been increasing slightly in volume, and other developed countries have been able to increase their share of the LDC agricultural import market much faster than has the United States. Therefore, based on the data, it is illogical to maintain the notion that increased agricultural production in developing countries has been a major factor in causing U.S. agricultural exports to decline during the past 5 or 6 years.

#### **Why U.S. Agricultural Export Values Have Declined Since 1981**

If decreases in U.S. agricultural exports cannot be blamed on developing countries' increases in agricultural production, why did U.S. agricultural exports decline by a third from \$43.3 billion in 1981 to \$28.6 billion in 1987?

Significantly, the United States is one of only a few major exporting countries to experience an absolute decline in export volume in the 1980's, and that was due entirely to a loss of market share in world agricultural exports. World export volume, in contrast, increased by 5.8 percent per year from 1980-81 to 1984-85. Therefore, it is not fair to say that the world agricultural export market has collapsed. It has grown, but the U.S. share has declined (12).

One study shows that since 1981, about 50 percent of the decline in U.S. agricultural export value has been accounted for by lower prices, not decreased volume (11). About 70 percent of the decline in value of U.S. agricultural exports can be attributed to declines in exports to developed and centrally planned countries, and 30 percent rests with declines in exports to LDC's. Thus, the bulk of the problem is with U.S. exports to the developed and centrally planned world. Therefore, it is not logical to blame LDC's for buying fewer U.S. agricultural exports when LDC total agricultural imports have not fallen by very much. The problem is that the United States is not keeping pace with other countries for the LDC agricultural import market.

Why, then, did the value of U.S. agricultural exports decline from 1981 to 1986?

The first reason is that from 1980 to late 1984, the U.S. dollar increased in value against many currencies. This raised prices for all exports from the United States, and a U.S. Department of Agriculture study estimated that the resultant decline in volume of U.S. agricultural exports amounted to \$6 billion between 1981 and 1983 (8). Although the value of the U.S. dollar has been falling since early 1985 relative to some currencies (for example, the Japanese yen and German mark), this decline has not been as substantial against many other important currencies. From February 1985 to August 1986, the U.S. dollar declined only 4 percent against 17 currencies of important U.S. buyers and competitors (2). It has actually risen against the currencies of several nations, including Canada and Mexico. Further, because some currencies are pegged to the U.S. dollar, it is difficult to devalue the dollar against these currencies. Given these situations, it has taken longer to reduce U.S. agricultural export prices through U.S. dollar declines than might be expected.

Second, other developed countries have increased their agricultural exports, thus increasing their share of the world agricultural export market from 39

percent in 1965-67 to 45 percent in 1982-84. The U.S. share has remained relatively constant (19). The U.S. share of various agricultural commodity exports has declined (table 3). For example, the countries that were increasing their export market shares of wheat during this time were Canada, Australia, Argentina, and Western Europe, none of whom have received agricultural development assistance from the United States for decades.

Table 3--U.S. share of world exports for various agricultural commodities

Commodity	1981	1987
<u>Percent</u>		
Wheat	45	30
Coarse grains	65	44
Soybeans	90	60
Cotton	32	25

Source: (11).

Third, developing countries have reduced their growth in the value of agricultural imports. This can be partly attributed to decreasing availability of foreign exchange in these countries. From 1970 to 1984, the percentage of gross national product (GNP) that was debt service among LDC's increased 114 percent in low-income countries, 219 percent in lower-middle-income countries, and 221 percent in upper-middle-income countries (19). During this same time, exports of LDC's generally decreased: the annual decline from the mid-1970's to 1983 was 0.8 percent for low-income countries and 0.4 percent for lower-middle-income countries, although upper-middle-income countries saw an annual increase of 0.5 percent. Out of 68 developing countries with data listed in the World Bank's World Development Report 1988, only 9 (13 percent) had positive current account trade balances (20). Thus, foreign exchange in developing countries for agricultural imports is becoming more scarce. Yet even with all their economic difficulties in the 1980's, developing countries have been growing in importance as markets for U.S. agricultural exports (table 4).

Table 4--Percent of U.S. farm exports that went to developing countries

Commodity	1980	1983
<u>Percent</u>		
Food grain	55	67
Coarse grain	29	42
Oil seeds	15	19
Cotton	42	44

Source: (9).



Reduced growth in agricultural imports among developing countries can also be attributed to their slower economic growth. One study reports that annual GNP growth among LDC's, which averaged a strong 6 percent during the 1970's, fell to 1.4 percent in 1981, to 0.9 percent in 1982, and to a dismal 0.4 percent in 1983 (9). Further, GNP per capita in many developing countries has declined in the 1980's.

A fourth reason for the declining value of U.S. agricultural exports since 1981 lies with U.S. policies of supporting agricultural prices. These policies have tended to increase world prices above what they would have been otherwise, thus encouraging other countries to increase agricultural production and exports. Additionally, U.S. restrictions of agricultural exports to several countries in the 1970's, and at other times to the Soviet Union, may have also made it attractive for other countries to enter the agricultural export business.

And fifth, the centrally planned countries have decreased their agricultural imports since 1980. At that time, they accounted for 11 percent of the world's agricultural imports; in 1983, they accounted for only 8 percent (19). Specifically, centrally planned countries have decreased their agricultural imports from the United States by 67 percent since 1981 (see table 2).

Not one of these reasons for the decline in U.S. agricultural export values since 1981 has much to do with increasing agricultural production in developing countries. Moreover, many researchers feel that the total volume of U.S. agricultural exports, which rose more than 10 percent annually during the 1970's and declined during most of the 1980's, will return to a more normal long-term growth rate of 2-3 percent annually between the late 1980's and the year 2000. The middle to late 1970's and early 1980's was an extraordinary period, and the conditions that defined it may not be repeated for some time to come.

#### **Relationship Between Agricultural Production and Imports in Developing Countries**

Does increased agricultural production in developing countries necessarily mean they will reduce their agricultural imports? Before this question can be answered, six important characteristics of developing countries must be acknowledged:

- o In many cases, agriculture accounts for a significant proportion of total economic activity. Sixty to 70 percent of the total population live in rural areas, and in many LDC's, more than 40 percent of the workforce is in agriculture.
- o As incomes increase, significantly more is spent on both more food and diet diversification. Food expenditures may increase 5-6 percent for a 10-percent increase in income. In many LDC's, 40-60 percent of income is spent on agricultural products, and as incomes rise, more is spent on meat and dairy products, which, in turn, increases the indirect demand for feed grains. Primarily for this reason, per capita grain consumption in developed countries is typically two and a half to four times that in developing countries.



- o In general, people who work in agriculture have lower incomes than those who do not. Therefore, an increase in income for agricultural workers will create a higher demand for agricultural products than the same increase would cause in the nonagricultural sector.
- o Population growth rates in developing countries, while declining slightly, are still relatively high and will remain higher than those in developed countries for many decades. The future world population growth will largely occur in developing countries.
- o The performance of the agricultural sector can be an important determinant of how rapidly the nonagricultural sector grows.
- o Nonagricultural sector growth in these countries can be quite high. This growth in many countries has caused an increase in the demand for imported agricultural products.

These characteristics indicate there may be strong possibilities for relatively high growth rates in the demand for agricultural products in developing countries. To support and increase economic development, many developing countries will have to increase their domestic agricultural production (6).

Is there evidence that such a positive relationship exists in developing countries between increased agricultural production and changes in agricultural imports? In one study, the group of 18 developing countries with the most rapid growth rates in per capita food production between 1970 and 1982 also increased total agricultural, corn, and soybean and soybean product imports 34, 97, and 257 percent faster than the group of 13 developing countries with the slowest growth in per capita food production (5).

Further, even developing countries that have become net exporters of agricultural products can also be expanding markets for certain agricultural imports. Malaysia, for example, a consistent net exporter of agricultural products, increased its imports of food, feed grains, and oilseeds from a wheat equivalent basis of about 1 million metric tons to almost 2.4 million metric tons from 1967 to 1983 (7). From 1970-72 to 1980-82, Brazil, a country that competes with the United States in soybean product exports, increased its imports of wheat and wheat products and corn and corn products from the United States by 27 and 86 percent, respectively. In addition, between 1970 and 1984, a time when Brazil was rapidly increasing its own agricultural production, the quantity of U.S. agricultural exports to Brazil increased by 8.7 percent per year, while the value of those exports grew by 16.3 percent per year (5). Finally, while the United States is acknowledged as a large net exporter of agricultural commodities, not so well recognized is its growth as an importer of agricultural products (table 1.). The United States is the third or fourth largest importer of agricultural goods in the world. As these examples show, increasing agricultural production along specialized comparative advantage lines in developing countries can complement increasing agricultural exports to them.

In a recent analysis of 65 developing countries from 1970 to 1982, increases in their per capita incomes were strongly and positively correlated with increases in their imports of agricultural goods and services (6). A 10-percent increase in per capita incomes for the 65 developing countries

included was associated with a 7.3-percent increase in per capita agricultural imports in these countries. For the low-income developing countries, an increase in per capita agricultural imports of 9.7 percent was associated with a 10-percent increase in the per capita incomes. Therefore, it is clear that agricultural imports of developing countries are dependent on increasing per capita incomes in these countries. Regarding this point, this analysis also showed that the correlation between per capita agricultural production and per capita income in developing countries is positive and strong.

For developing countries experiencing growth in per capita agricultural production, a positive and significant correlation was found between such production and per capita agricultural imports. In this study, there was no evidence that increasing agricultural production in developing countries had a negative and significant effect on their agricultural imports. A similar study found that the relationship between developing countries' agricultural productivity per worker and per capita gross domestic product (GDP) was positive and significant. In addition, a strong and positive relationship was found between per capita GDP and agricultural imports of developing countries (4).

A study conducted in Australia investigated, among other things, the relationship between developing countries' per capita growth rates in agricultural output and agricultural imports from the world and various regions and countries within the world (1). The results indicated positive correlations between per capita agricultural growth in developing countries and per capita agricultural imports from the world, developed countries, the United States, and Australia. This study went on to investigate China's experience with domestic agricultural production and agricultural imports. China's farm output increased by over 50 percent between 1978 and 1984, including significant gains in grains, red meat, sugar, and cotton. Yet, China's self-sufficiency in these foods actually fell from 1970-74 to 1980-84 because domestic demand growth outpaced growth in domestic production. Projections in this study indicate that China's net agricultural imports would decline if domestic food output growth were reduced. This outcome results because food output growth is closely correlated with income growth.

This evidence indicates that for LDC's, increases in agricultural production may be necessary for widespread income growth, which leads to increases in agricultural imports. Because of this, LDC's with the faster growing agricultural sectors were the faster growing markets for U.S. agricultural exports. Thus, American agriculture may have nothing to gain and much to lose from slowing down agricultural development in developing countries.

Regardless of one's position on the issue of how agricultural development assistance in LDC's affects American agriculture, it is clear that U.S. Government expenditures on such assistance in developing countries are relatively small. U.S. domestic agricultural commodity price and farm income support expenditures in 1983, not including the Payment-in-Kind, or PIK, program were 25 times larger than U.S. expenditures on agricultural, rural development, and nutrition assistance programs for LDC's. Or, to put it another way, what was spent on agricultural development assistance was only 4 percent of what was spent in support of domestic agricultural programs (18).

There are exceptions to this general proposition that agricultural development boosts broad-based income growth and, thus, the demand for imported agricultural products. For example, some countries have adopted policies



forcing reductions in imports and increases in exports of agricultural products regardless of the current situation they face. In other countries, unequal income distributions, poverty, and poor performance in the nonagricultural sector constrain any demand increases resulting from increased agricultural production.

The evidence shows that total agricultural exports to developing countries are not, in general, harmed by increased agricultural production in these countries. Increasing production of specific commodities will likely reduce imports of those specific commodities. However, imports of other agricultural commodities are likely to increase. It is these mixed results regarding specific commodities that cause some of the conflict between interests in U.S. agriculture and development assistance. U.S. soybean farmers have expressed substantial concern about the possible effect U.S. development assistance activities may have had in increasing soybean production in Brazil. These increases in soybean production and exports, causing increases in income and foreign exchange, may have stimulated additional imports of U.S. corn and wheat into Brazil. Few, if any, wheat or corn farmers expressed support for the development assistance that may have helped expand soybean production in Brazil. U.S. commodity groups that may be harmed in certain LDC situations may be more vocal in protest than the support heard from the general U.S. agricultural community that may have gained.

#### **Policy Implications**

One of the keys to developing a mutually beneficial relationship between agricultural development and U.S. agricultural interests is to strengthen the linkages between increased farm output and widespread income growth in both the agricultural and nonagricultural sectors in developing countries. This can be done by:

- o Encouraging improved policy analysis and implementation;
- o Developing rural infrastructure;
- o Improving the rural poor's access to resources and educational opportunity;
- o Improving agricultural technology development and transfer systems; and
- o Enhancing the development of business activity that supports agricultural production growth.

In addition, trade policy changes must be considered that will enable developing countries to increase exports, employment, and incomes in the nonfarm as well as farm sector.

Because economic policies have such a pervasive effect on agricultural growth, the developing and implementing of appropriate policies can substantially affect agricultural growth. Setting appropriate exchange rates, reducing subsidies for capital-intensive industries, and establishing marketing policies that provide incentives for agricultural production growth strengthen the production-income growth linkage. Development of human resources and institutions to analyze and implement policies is important if developing countries are going to cope well with the problems and opportunities of interdependence in the future.



For agricultural production to effect widespread income growth, rural infrastructure must be improved in many developing countries. Roads, communications, and other services are required to better integrate the rural sector into the economy. Without the integration, the agricultural production-income linkage between the farm and nonfarm sectors is substantially weakened.

Another way to strengthen the effects of agricultural growth on widespread income increases is to improve the access of the rural poor to land, capital, and education. Without shortrun income-earning opportunities (through access to land and capital) or longer run income-enhancing opportunities (through access to education) for rural people, agricultural production increases will likely have very limited effects on widespread income growth.

Nonagricultural growth in developing countries is often accomplished by development of labor-intensive businesses. One key to fostering such development is to provide agricultural products at declining real costs to low-income workers. To do this and to provide incentives for agricultural development, new cost-reducing technologies must be adopted by farmers. Without a flow of agricultural technology, employment and income gains are less likely to occur in the nonfarm sector.

The development of an agribusiness sector is another key to enhancing the positive relationship between agricultural production and income growth. Not enough attention has been given to these aspects of agricultural development in our development assistance strategies. Actions needed include personnel education and training, infrastructure development, credit provision, and policies that promote and regulate business development.

Besides these internal implications for developing countries, other changes are needed in trade relations between developing and developed countries. Many developing countries have serious foreign exchange problems limiting their ability to import agricultural products. As agricultural production expands and employment in labor-intensive industries grows, these countries will need to develop export opportunities if they are to increase agricultural imports. With import quotas for some agricultural and labor-intensive goods and high tariffs on processed products, many developed countries seriously constrain the ability of developing countries to increase foreign exchange holdings and achieve broad-based income growth and, therefore, to increase their agricultural imports.

This relationship between agricultural growth in developing countries and their imports of agricultural products is complex. There will be time lags involved before the full effects of increased agricultural output are felt on income growth and agricultural imports. By carefully choosing certain commodities, time periods, and countries, one can prove almost any hypothesis. However, in the aggregate, it appears that wise agricultural development and broad-based income growth in developing countries are in the best interests of American agriculture.

#### **The Likely Scenario for the Future**

Looking ahead, the food gap in developing countries between production and demand will probably increase moderately over the next two decades. A recent study by the International Food Policy Research Institute has indicated that

the overall net food deficit, which was 50 million metric tons in 1980, will be about 70 million metric tons by the year 2000 (10).

In addition, many developing countries that have had difficult economic times in the past few years will need to improve their foreign exchange positions and income growth records to continue as growing markets for agricultural imports. To accomplish these goals, agricultural development must be an important part of their plans.

At the same time, while LDC's will probably not be the growth market for the next 20 years that they were for agricultural imports from 1973 to 1981, they can be the most important growth market for agricultural exporters. Whether the United States can effectively compete with other developed countries for these developing-country markets is another question.

Finally, macroeconomic forces such as interest rates, foreign lending, currency values, LDC export performance, trade barriers to LDC exports, oil prices, and other variables will have major effects on developing countries' ability to import agricultural products. In addition, the trade and domestic policies adopted by developed and developing countries will greatly influence the size and composition of developing countries' agricultural imports in the future. If LDC's are forced to turn inward by a lack of export opportunities and foreign assistance and if they adopt import substitution and self-sufficiency policies, they may increase their agricultural imports only slowly. If this happens, it will probably be because of unfavorable macroeconomic forces and poor agricultural production development performance rather than because agricultural production grew faster than the demand for many agricultural commodities.

LDC's are generally the best hope for expanded markets for the world's agricultural exporters. For this hope to be realized, however, these countries will have to generate employment opportunities and achieve income increases for the billions of low-income people they contain, and this will require their successful agricultural development. Effective development assistance in agriculture that improves employment and income in developing countries can benefit vast numbers of poor people as well as American agriculture. Thus, the broader picture is one of mutual benefit for both American agriculture and agricultural development in poor countries.

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## **Development Assistance, Trade Policies, and Farm Programs: The Interconnections**

**Robert L. Thompson<sup>1</sup>**

One of the most important changes that American agriculture has experienced in the past 15 or 20 years is increasing dependence on the world market and on trade policies. More and more of our farm and commodity organizations are taking a much greater interest in the internationalization of American agriculture and associated agribusiness. Most discussions of internationalization focus on trade policy, but we should give at least equal, if not higher, billing to Third World economic development.

### **Importance of Economic Growth**

To set the stage, I will review briefly the 1970's and early 1980's. To anticipate my conclusion, the most important variable--bar none--influencing the size of the market for American agriculture in the 1990's and the early 21st century will be the rate of economic growth around the world.

I cite the experience of the 1980's, compared with the 1970's as evidence of this. The average annual growth in grain consumption of the countries outside the United States during the 1970's was 34 million metric tons. The rate of growth in grain production in these countries was 24 million metric tons per year. This left a gap that grew at the rate of 10 million tons per year during the 1970's.

In the early 1980's, the rate of production growth in countries outside the United States accelerated about 5 million tons per year to 29 million metric tons per year. The big change in the 1980's was the decline in the rate of growth in cereal consumption. Consumption in countries outside the United States plummeted from the 1970's 34 million metric annual rate of growth to 19 million metric tons per year in the early 1980's.

So in the early 1980's, we had production growing at 29 million tons per year and consumption growing at only 19 million metric tons per year. The gap that had been widening at the rate of 10 million tons per year in the 1970's started narrowing at the rate of 10 million tons per year in the early 1980's.

A lot of people attributed the export growth of the 1970's to population outrunning food production capacity of the world. If that were the correct explanation, the rate of growth in consumption in the 1980's would have continued at a rate similar to the 1970's because population continued to grow. Instead, consumption dropped by almost half.

So, we had a misinterpretation by a lot of observers of what was going on in the 1970's. What was really causing the rapid growth in cereal consumption around the world in the 1970's was not so much the growth in world population. The population was indeed growing, but more important, the rate of growth in per capita incomes around the world and, in particular, in low-income countries was growing as well. As poor people gain more income, one of the first things they do is upgrade the quality of their diet.

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This almost always means including more animal protein in their diet. This dietary change raises the demand for the feed grains and protein meals necessary to produce that animal protein, and American farmers are among the world's most efficient producers of feed grains and protein meals.

### **Competitiveness and Future Export Growth**

The United States is running a trade deficit in excess of \$150 billion a year. This leads many observers to conclude that the American economy has lost its global competitiveness. I fail to reach the same conclusion. I feel that the competitiveness of many sectors of the American economy has been masked by an overly strong dollar.

Our policies of tight money supply and loose fiscal policy have created a large borrowing demand by the U.S. Government. This demand competes with the private sector for the available supply of savings in the American economy. This competition for savings, together with the relative attractiveness of the U.S. economy for investment by foreigners, has caused a large net capital inflow to America.

Under floating exchange rates, a country running a net capital inflow must, of necessity, generate a current account deficit of the same magnitude. This means that, as long as the conditions causing the large net capital inflow exist, the United States inevitably will run a trade deficit of approximately the same size. The exchange rate gets bid up as far as necessary to generate the requisite current account deficit. Therefore, it is erroneous to conclude that our trade deficit reflects a loss in global competitiveness of the American economy. Rather, the trade deficit is the unavoidable outcome of our large budget deficits and of the relative attractiveness of the United States over other countries for international investors.

Our current situation is similar to that of Switzerland in the 1970's. Switzerland became known as the world's safe haven for bank deposits, partly because of its famous numbered accounts. But no matter what the reason, this caused Switzerland to run a large net capital inflow. The Swiss franc was bid up to such high levels that it decimated the country's traded goods sector. In desperation, Swiss banks began charging a warehousing fee instead of paying interest on savings deposits to reduce the attractiveness of Switzerland as a safe haven for international capital.

In a sense, in the 1980's the United States is suffering from the "Swiss Disease." Until the conditions causing the present large net capital inflows change, we inevitably will run a large trade deficit. The first and most obvious condition to change, of course, is to reduce our Federal budget deficit and, thereby, reduce the competition between the public and private sectors for the available supply of savings in the United States.

In considering competitiveness, we really must consider two dimensions. The first concerns competitiveness among sectors within our own economy, and the second concerns competitiveness of each of those sectors of the American economy relative to the same sectors in other countries.

First, within any economy, one can conceptualize a hierarchy of sectors ranked from that with the greatest comparative advantage to that with the greatest comparative disadvantage. That sector with the greatest advantage always will



be a net exporter at any exchange rate. Similarly, the sector with the greatest comparative disadvantage always will be in the net import column at any exchange rate. But in the middle of the ranking, we have a group which we might call swing-sectors which, if the dollar is weak, will be in the net export column, but if the dollar is strong, will be in the net import column.

With an unusually overvalued dollar, as in the early 1980's, more sectors than usual were pushed into the net import category. So we can think in terms of competition within the American economy among sectors for the available export slots at any given exchange rate. If we are running a large net capital inflow and, therefore, trade deficit, there are fewer export slots open than when capital is flowing out and a trade surplus must occur.

### **Technological Change**

Technological change causes productivity to grow faster in some sectors than in others, changing the comparative advantage ranking. Export sectors which stagnate technologically can slip downward in the hierarchy and move into the net import category. Other sectors with more rapid technological change will rise in the ranking and may move into the net export column. In a dynamic economy like the United States, we have exchange rate changes, determining how much of the economy is in the net export category, and productivity, determining which sectors will fall in that group.

Therefore, as we try to account for what has happened to U.S. agricultural exports in the last few years and where they will be going in the future, we must think not only about the relative yields of our crops in comparison with those in other countries, but also how American agriculture is doing relative to other sectors of our economy in productivity growth.

American agriculture is abundantly endowed with fertile soil, and favorable climatic conditions, but this accounts for only part of our comparative advantage. Much more rests on the cumulative investments that have been made in agricultural research and extension over the past century. These investments have given American agriculture one of the fastest rates of growth in productivity of any sector of the U.S. economy.

It is important to remember that in the 1930's, there was no perceptible difference in crop yields among the United States, England, India, and Argentina. But in the 50 years since, U.S. yields have shot upward. U.S. agricultural productivity grew faster than in other industries and faster than agricultural productivity in other countries. This, more than anything else, accounts for the great increase in U.S. farm exports relative to other suppliers.

Unfortunately for us, many other countries have caught on to the source of our growth. While our rate of investment in agricultural research has stagnated in the past 15 years, many other countries have substantially increased their agricultural research and development investments. This is closing the productivity gap between the United States and other countries' agricultures. One might say that we now find ourselves on a global technology treadmill and we must keep investing to maintain productivity growth to maintain our position relative to other agricultural exporting countries.

My second prescription for improving the global competitiveness of American agriculture is to increase the rate of technological advance by maintaining

support for agricultural research and development. We are poised on the threshold of a new technological revolution in agriculture, that of biotechnology or genetic engineering. This revolution has the potential to increase agricultural productivity and reduce our unit costs of production by yet unknowable means.

The biotechnology revolution is no more stoppable than was the Industrial Revolution, and it holds similar potential for improving the future well-being of mankind. There are those who would slow or stop this new development. They remind me of the attempts by the Luddites, who threw their wooden shoes into the gears of early Industrial Revolution factories. There are valid reasons for caution with respect to genetic engineering, but we must recognize that it can provide great productivity growth, and whichever countries permit it to proceed will reap increased international competitiveness.

### Farm Program Legislation

The third prescription for improving the global competitiveness of American agriculture is to avoid public policy measures that mask our underlying comparative advantage. In the Food Security Act of 1985, we took a large step in this direction by dropping loan rates to market-oriented levels. This removed an important impediment that had been pricing us out of the international market in the early 1980's.

In the 1970's, we captured virtually all the 10-million-ton-per-year annual growth in world grain trade because we were highly competitive. We had gotten our loan rates down to competitive levels in the 1960's, we devalued the dollar twice in the early 1970's, and we had about 60 million acres of land set aside through the old soil bank and related programs. We could rapidly expand supply and were in a highly competitive price position that permitted us to capture most of the growth in the world market. But, in 1981, a number of factors changed to turn the world of the 1970's on its head.

The Food Security Act of 1981 legislated rigid minimum loan rates. In effect, we announced to the world the minimum prices we would take for our exports for the next 4 years and posted them for all the world to see. We invited our competitors to underprice us by just enough to take away export markets.

By contrast, in the Food Security Act of 1985, we provided for downward flexibility in loan rates. It also authorized a number of other measures, including the Export Enhancement Program, to facilitate recovery of export markets that had been taken away through unfair competition, particularly through export subsidies from the Common Market. The dollar also has come down by a substantial margin. Together, these measures have put us back in a much more competitive position in world markets.

But there are other aspects of current farm policy that continue to impede our competitiveness. One is acreage reduction programs. To qualify for deficiency payments, every farmer must retire a certain fraction of his acreage base, for example, 20 percent in corn in 1988. This means, in effect, that we asked every farm to spread its total fixed costs over 80 percent of its output. Such measures raise the national average cost of production, relative to our competitors who suffer from no such constraints.

Moreover, we have long relied on policies that create artificial scarcity of farmland, thereby raising its price higher than otherwise would have occurred.



This applied to the old Soil Bank program of the 1950's and 1960's. It now applies to our acreage reduction programs, and it could apply to the conservation reserve. On the demand side, larger income streams associated with direct Government payments and price supports increase the returns to farmland. Together, these factors increase the price of U.S. farmland beyond what it otherwise would be and raise our costs of production relative to those of competing countries.

To put this in perspective, contrast the situation in the Argentine Pampa and the U.S. Corn Belt over the past several decades. Argentina for years has imposed an export tax of more than 25 percent on the value of corn exports. Because land tends to be the residual claimant on farm returns, the corn export tax has held farmland prices at very low levels. This means that an Argentine corn grower has a much smaller investment in his farm, which lowers his cost of production.

In addition, land in Argentina is so cheap that crop production has remained far more extensive than in the United States. That is, it has not paid to increase the rate of fertilizer application to any significant degree. In contrast, the U.S. Government payments and artificial scarcity of farmland have bid up Corn Belt land prices and, in turn, our cost of producing corn. In addition, high land prices sent our farmers the signal to increase the rate of fertilizer and other chemical use to higher levels than might have been justifiable on cheaper land.

The recent land price deflation caused significant financial stress to U.S. farmers who had borrowed substantial sums to buy their land. In the long run, this write-down of land values will help restore our international cost competitiveness relative to other suppliers, like Argentina, which never let its land prices get bid up to such high levels as in the United States.

We also need to recognize that the cost of producing each crop varies significantly across regions of the country as well as across farms within any given region. The U.S. Department of Agriculture's Economic Research Service's annual costs and returns survey shows that more than 85 percent of U.S. corn production was produced at a variable cost below even the mid-1980's depressed international prices. This means that the vast majority of U.S. corn producers can compete in the world market. If we were to impede our farmers' competitiveness by turning to higher price supports or mandatory supply controls, this would raise our national average cost of production, and efficient producers, who produce the bulk of our output, would lose their opportunity to export.

Nevertheless, there still are those who would raise farmers' incomes by restricting the volume of agricultural production through mandatory supply controls. The resulting price increases would reverse the progress made in the Food Security Act of 1985 and set in motion a permanent downsizing of our farm sector, as we would forfeit the export market to less efficient competitors and likely send our livestock and poultry sectors overseas.

#### **Creating a Better Trade Environment**

Global agricultural trade grew at the rapid rate of 4.3 percent per year in the 1970's. This was fueled by rapid economic growth throughout the world, particularly in the developing countries, and by abundant cheap credit.



In the 1980's, global trade has grown at only a sluggish rate of 1.3 percent per year. The rate has slowed because of a much slower economic growth in the world as a whole and, in particular, by stagnation in the Third World.

Rampant protectionism resulted from the early 1980's global recession, and this further slowed world trade. Liberalization of trade and resumption of more rapid economic growth will be necessary for international trade to resume its performance in the 1990's.

#### Need for Trade Negotiations

This environment of disarray in world agriculture and the need to rethink issues of competitiveness and comparative advantage puts in perspective the urgency to get on with the task of multilateral trade negotiations (MTN). This occurs mainly in the General Agreement on Tariffs and Trade (GATT), but there are also important deliberations that go on in the economic summit meetings, at the Organization for Economic Cooperation and Development (OECD), and on a bilateral basis. In the present GATT round, it is essential that not only border measures but also domestic farm programs be on the negotiating table.

Little progress has been made in past GATT rounds on agriculture because domestic farm programs never have been on the table. With few exceptions, the border measures in place on agricultural goods are there solely to validate domestic farm programs. And it is these domestic farm programs that subsidize larger production than would otherwise occur. This larger output ends up being dumped into the world market, depressing prices. Thus, to resolve international agricultural trade tensions, we must get at the domestic price and income supports.

Recent work at the OECD in its trade mandate study calculated a summary indicator of the net effect of the whole range of policies that augment returns in agriculture, whether they be input subsidies, price supports, export subsidies, quotas, deficiency payments, or what have you. I think we must seek to freeze the total level of assistance at present levels and set them on a downward adjustment over time. It will be a new development for the GATT to consider domestic subsidies, but this is the only way we can hope to address the current disarray and ultimately solve agriculture's problems.

Very little liberalization of manufacturing trade was achieved until the Kennedy Round of GATT negotiations. Progress was made then by going to across-the-board formula cuts in tariffs on all products in all countries simultaneously, in place of the former offers-and-requests approach used in the two earlier GATT rounds. In each ensuing GATT round, tariffs have been reduced by 20 or 30 percent over 5 years or so. Then, they went back in the next round to do it again. As a result, today there are only very modest tariff barriers to international trade in manufactured goods. In agriculture, we have never made much progress at trade liberalization because we have only used the offers-and-requests approach, and domestic agricultural policies have never been on the table. This time, domestic policies are fair game, and if we insist on across-the-board cuts in all commodities in all countries simultaneously, I feel we can achieve some progress in liberalizing agricultural trade.

One of the important benefits from a freer and more open world trading environment is often omitted from discussions. Third World countries, which

are our greatest potential growth markets for farm products in which we have a comparative advantage, will benefit significantly from a freer and more open trading environment as well. The Koreas and Taiwans of the world, which are often held as examples of successful economic development, have also been some of our best growth markets. Those countries succeeded because they underwent export-led economic development. One of the more important factors in their successful development was that they did not follow a protectionist, import-substitution path of economic development. Rather, they identified industries in which they had comparative advantage and permitted them to trade and to grow, free of as many distortions as possible. Those industries thrived and national economic development proceeded rapidly, and American agriculture was a tremendous beneficiary of that growth.

So, a freer and more open trading environment would certainly be of value not only to American agriculture but also to the economic growth of those markets to which we hope to sell more products in the 1990's and the early 21st century.

#### Adjustment Process

We need to get a clear understanding of what forms of assistance to agriculture will be permissible and not subject to countervailing duties. We must recognize that, politically, governments will probably have to continue to support farmers' incomes. We must seek to ensure, however, that this support does not stimulate larger production.

It is well known that nontariff barriers to trade in farm products cut the link between world and domestic prices. This means the adjustment to any shock in the world market must be borne by a small group of countries that transmit world price adjustments into their domestic economies.

As a result, world prices are far more volatile in this environment than they would be if only tariff barriers were employed to protect national agricultures. Another objective in the GATT should be to shift as many border measures as possible away from nontariff barriers or quantitative restrictions over to tariff barriers.

Relative to the adjustment process, the large subsidies received by some parts of agriculture in each industrialized country reflect the political power and lobbying strength of the benefited interest groups. But the existence of these subsidies generates larger returns that get capitalized into the values of the assets producing those products.

To liberalize agricultural trade will inevitably require reduction in these artificially high returns and in the associated asset values. It is naive to believe that we can be very successful in liberalizing agricultural trade unless adjustment policies can be put in place to facilitate the adjustment and compensate the losers for at least part of their losses, both in income and in land values as well as in the value of fixed capital investment.

For unless the losers are compensated, they will be able, through their political power, to thwart implementation of the overall agreement that comes out of the trade negotiations. To avoid this, adjustment assistance has to be part of the plan for each country's MTN strategy.



This adjustment process may take a number of years. Tariff concessions agreed to in the Tokyo Round took nearly a decade to be fully phased in. Thus, we will also have to agree on short-term policies to deal with surpluses as protection levels are reduced. Land retirement programs, such as those pursued by the United States, are one option.

If we are to achieve cuts in subsidies and in protectionism around the world, we are going to have to put our own protectionist barriers on the negotiating table. I think that there is sufficient concern around the world, that by the time we get to the end of the Uruguay Round, we will make some headway at leveling the playing field. It is not likely to be politically possible to eliminate all agricultural subsidies around the world in the next decade. But, there is a chance that we could achieve a significant across-the-board reduction in agricultural subsidies in this GATT round and then go back in 5 years or so and do it again.

To facilitate structural adjustment, we need to identify measures that can minimize the human costs. This might include job retraining programs, rural development to increase the availability of nonfarm jobs in rural areas, or perhaps assistance in relocation. Rural communities need to increase their emphasis on the quality of the education they provide their youth. Education appears to be a key determinant of the attractiveness of an area for industrial development and for job mobility.

#### Exchange Rate Volatility

The second concern is exchange rates and their volatility. In the 1980's, we have seen real exchange rates adjust by more than 50 percent relative to one another. After spending 5 years in tortuous negotiations to come up with 10-percent changes in tariff rates, only to see the outcome totally swamped by a 50-percent adjustment in exchange rates, negotiators have little interest in entering the fray of the coming GATT round without some expectation that exchange rates will be more stable in the future. France, in particular, has been adamant that international monetary negotiation either should precede or be carried on in tandem with the GATT round.

The Plaza Accord meeting in September 1985 and the Tokyo Economic Summit both addressed this problem. The volatility of exchange rates we have seen in the 1980's reflects, in part, the lack of coordination or synchronization among national macroeconomic policies.

The Tokyo Summit communique produced agreement that macroeconomic policies would be coordinated in the future among the principal, industrialized countries. This has contributed to an environment of greater exchange rate stability.

Nevertheless, the world awaits the effects of Gramm-Rudman-Hollings and associated U.S. measures to cut our budget deficit in order to remove the attraction to such large capital inflows into the United States and the associated danger of precipitous changes in the value of the U.S. dollar. While the outcome is uncertain, we must expect concern for exchange rate volatility to be in the backs of trade negotiators' minds during the GATT round.



### Third World Development

Economic development is obviously concerned with raising per capita incomes. But, what we are concerned about here is not only with raising average per capita income, because that can be done by raising the income of the top 10 percent of the income classes by a large fraction and leaving the bottom 90 percent untouched. That would have little effect on total food consumption. What we really need to see in Third World countries is broad-based economic growth that does not leave the poorest of the poor behind, as has occurred in a number of countries.

As national economic development occurs, this inevitability leads first to a reduction of the percentage of the population employed in agriculture and eventually to a reduction in the absolute number of people employed in agriculture. But if labor is to be released from agriculture to the growing manufacturing and service sectors of those economies, it is essential early in the process that there be some increase in agricultural production in those countries.

I know of no country that has achieved rapid growth in per capita income that has not also developed its agriculture along the way. But, in every case that I have examined, the data are also compelling in showing that if the rate of growth in per capita incomes enjoyed by the country as a whole is sufficiently rapid, consumption of agricultural products will grow much more rapidly than the increase in agricultural production itself.

There are only a few countries that have sustained a 3-percent annual growth in agricultural production over any extended period of time. In fact, 2.5 percent per year is a good performance. On the other hand, when you take the population growth together with the effect of increasing per capita incomes in poor countries, it is not at all difficult to see 6- to 7.5-percent-per-year annual growth in consumption of agricultural products. It is easy to achieve consumption growth rates that are 4 percent and even 5 percent faster than increases in food production in such countries. This is why the Third World countries are such good potential growth markets for us. If they are permitted to export goods in which they have a comparative advantage, they will have foreign exchange to pay for our exports.

There are complex relationships between economic growth, agricultural development, and international trade, yet the data are compelling that American agriculture has a tremendous interest in successful, broad-based economic growth throughout the world.

### Third World Debt

The greatest shortrun impediment to rapid economic growth appears to be the Third World debt problem. The Third World countries were among the fastest growth markets for U.S. farm exports in the 1970's. One thing that made this possible was the fact that we increased our imports of products in which those countries have a comparative advantage.

A number of these products such as sugar, textiles, footwear, and steel have met increasing protectionism in the 1980's to protect workers in these industries from job displacement by cheaper imports. As this has occurred, the foreign-exchange-earning capacity of Third World countries that buy our farm products has been reduced. What comparative advantage is all about is

that the relatively most efficient suppliers of each good sell those goods overseas and, thereby, earn foreign exchange that can be used to buy goods from other countries, that are relatively more efficient producers.

We cannot have it both ways. If we aspire to export farm products in which we have a comparative advantage, we must be willing to buy the products in which the buyers of our exports have a comparative advantage. We are now engaged in the Uruguay Round of international trade negotiations, designed to reduce barriers to international trade and to reduce subsidies on a wide range of goods and services, including agriculture. American agriculture has a great deal to gain from a freer and more open international trading environment that would lead to faster economic growth in the Third World. Many of the goods in which U.S. agriculture enjoys a comparative advantage are goods whose consumption increases rapidly during economic growth.

American farmers also have a great vested interest in successful resolution of the LDC debt problems so that more of those countries' current export earnings can go to pay for imported goods instead of servicing the international debt as is happening now.

#### Food Aid

Many observers are concerned that when you put food aid into developing countries it can easily glut the market, drive down market prices, destroy the incentive to local agriculture, and set back agricultural development. This is the case in many Third World countries where agriculture already is a disadvantaged sector. The history of the policies in most developing countries is that agriculture has been taxed, not subsidized. Agriculture has already suffered from enough barriers to development in such countries that the last thing they need is for a lot of food aid to get dumped into the market and further reduce incentives to development.

On the other hand, there is abundant evidence that has accumulated over the past decade or so that food aid, when judiciously used, can be an important resource transfer from high-income to low-income countries. There are many examples of food-for-work programs where people who could not afford to buy that food were employed productively in development projects, paid in-kind with food. The market demand for food was not reduced because this is simply a demand that would not have been validated through purchasing power. By such in-kind transfers of food, you achieve effective investments in development projects and also increase the real incomes of poor people. The Food for Progress program, put in place several years ago, has demonstrated that there are opportunities for more effectively using surplus stocks as a means of transferring resources from high-income countries to poor Third World countries.

#### Technology Transfer

I also would like to address the issue of technological transfer. There is some antagonism toward the land-grant universities and other American agricultural research institutions from commodity organizations concerned that we are giving away our agricultural technology and, in turn, our comparative advantage.

Technological change is an important shifter of comparative advantage in agriculture around the world. But commodity organizations fail to appreciate



the importance of the two-way transfer of technology that goes on when land-grant universities and other American research institutions are involved in agricultural projects in Third World countries. For example, all the genetic material resistant to rust in American wheat varieties has come from Africa. There were no American varieties that had rust resistance. Sorghum, one of the important drought-tolerant crops in the semiarid parts of the United States and in which there has been increased interest since the 1988 drought, is another crop coming from East Africa. It may have genes that could be spliced into corn, using genetic engineering techniques, to give corn greater drought tolerance. In the future, we will draw on many materials not indigenous to the United States.

When you get right down to it, how many crops are indigenous to the United States? We do not have a monopoly on agricultural technologies, and there are tremendous opportunities for American agriculture to benefit from the reverse flow of technologies that come from collecting genetic materials in Third World countries in exchange for often more basic research techniques that flow the other way.

Some foreign countries are so concerned about the value of their genetic material that they are hesitant about letting U.S. scientists onto their research stations for fear of losing a favored market position. My point is that here again is an area where there is a lot of misinformation. Many people incorrectly feel that we have all the technological answers in the United States. Again, I feel, as dean of a land-grant college of agriculture, that our farmers benefit significantly from the flow of technology that comes back to the United States from countries in which we may be involved in developing an agricultural research capacity or a college of agriculture.

### **Conclusions**

So, in conclusion, macroeconomic policy, farm programs, trade policy, and development assistance, indeed are deeply interwoven. If we desire a profitable and economically healthy American agriculture in the 1990's and the early 21st century of a similar size to that which we have today, we have to sustain our export performance. If we want our farm sector and associated agribusinesses to be bigger than they are now, or to put any of the presently underused resources back to work, we will have to export more because that is really the only potential growth market of any size.

To expand the total size of the market, the single most important factor will be the rate of economic growth, particularly in the Third World. But, we also have to be concerned about our share in that market. This means we need to do everything possible to be sure we can compete on a level playing field and that the policy barriers to movements of the commodities in the world market are as low as possible.

And finally, we must not shoot ourselves in the foot by letting our own policies, whether they be farm policies that set our price supports too high or macroeconomic policies that cause the dollar to be overvalued, artificially price our products out of the market.



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Loan (Nonrecourse loan) Rate	Advance Deficiency
Deficiency Payment	Base Acres & Program Yield
Original Deficiency	0-92 & 50-92
Reduced (Findley) Loan Rate	Commodity Certificate
Emergency Compensation	Posted County Price (PCP)
Acreage Reduction Program (ARP)	PIK and Roll
Paid Diversion	Export Enhancement
Base Acres	Farmer-Owned Reserve (FOR)
Program Yield	Corn (& Wheat) Catalog
Program Production	Reserve Rollover
Basic Commodities	Conservation Reserve Program
Acreage Conservation Reserve	Disaster Payment
Conservation Use	Marketing Loan
Payment Limitation	

*Part one of this report concentrates on the left side of this list, and Part two covers the seven mechanisms at the top right.*

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